FLIGHT
& AIRCRAFT ENGINEER.

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Founder and Editor: STANLEY SPOONER

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CONTENTS.

EDITORIAL COMMENT

ORD LONDONDERRY is certainly not to be congratulated on the way he handled the recent discussion in the House of Lords arising out of Lord Ampthill's questions apropos the dismissal of Miss Douglas-Pennant from the post of Commandant-in-Chief of the W.R.A.F. The main issue arising out of Lord Ampthill's queries was wrapped up in his desire to ascertain from the Government whether the Prime Minister appointed Mr. Cecil Harmsworth to enquire into Miss Douglas-Pennant's dismissal; whether Mr. Harmsworth recommended that in justice to her a full judicial enquiry should be held; if the Prime Minister promised that such an enquiry should be granted; and if it was a fact that the enquiry had not been held and that the Air Ministry now declined to have it held?

L'Affaire Douglas-Pennant

Lord Londonderry, in reply, said that the Government were anxious that every aspect of the matter should be put before the House. His whole desire was to show that the Air Ministry had not acted unjustly, and had cast no aspersion upon the character of Miss Douglas-Pennant. It was quite true that she had been superseded. At the inauguration of the W.R.A.F. an enormous number of difficulties had to be overcome, and the Government were well aware that she did her utmost to overcome them, but, in the opinion of Lord Weir, Miss Douglas-Pennant was unable to so overcome them. Lord Weir satisfied himself that there was a large amount of disorganisation in the Force, and that the control was not of such a character as to justify that state of affairs continuing. The wish of the Government was that he (Lord Londonderry) should say that they felt very acutely that Miss Pennant was not treated with the consideration to which she was entitled. But that was not a ground for enquiry. With regard to the statement that the Prime Minister had given a promise that an enquiry should be held, he could get no corroboration whatever, and he wished to know on what authority the statement was made. A case of supersession was always a matter that caused disappointment, but it was a principle that could not be altered. If the question raised was one to enquire as to the merits of the action which the Secretary of State took in superseding Miss Pennant, that was a course of action the Government could not countenance for a moment. There was apparently an idea in the mind of Miss P nn nt that she had been the victim of malice and conspiracy, and if a *prima facie* case could be brought forward an enquiry should most certainly be held.

Lord Ampthill took the strongest exception to the reply. As he very properly insisted, this was not a case of supersession, but of dismissal, and every public servant had a right to know the ground of his dismissal. In this case various Ministers concerned have disagreed as to the cause of dismissal. Gen. Brancker told Miss Pennant she was dismissed, not because she was inefficient—he went out of his way to say she was efficient—but because she was unpopular. Lord Weir said it was not because she was unpopular, but because she was not getting on well with certain women's organisations. Then, later on, Gen. Seely gave the reason as being Miss Pennant's inefficiency!

We confess we are entirely in sympathy with Miss Pennant in the matter. We do not know whether she was an efficient commandant of the Force or not, nor do we know any more than she herself appears to know, the real grounds for her dismissal. But, as Lord Ampthill pointed out, it is the fundamental

right of every public servant to know why he is dismissed and it is this right which has been denied in the case under discussion. As a matter of fact no-one seems to know why Miss Pennant was dismissed and, that being so, it follows as a matter of course that she remains under the stigma which is inevitable in a case of what may quite justifiably be described as a hole-and-corner dismissal from a post of considerable public importance. We are told, and it has not been denied, that Mr. Harmsworth recommended a full judicial enquiry. Again, we are told, and once more no categorical denial has been made, that the Prime Minister promised such an enquiry. Miss Pennant herself has stated publicly and in the most definite terms that she was the victim of conspiracy and malice. Unless, therefore, the Government really has something to conceal or some individual or persons to protect, the case for full enquiry seems to be completely established. On every ground of public interest that enquiry is called for and we trust that Miss Pennant's friends will continue to insist that the promise of enquiry, which has never been controverted, shall be kept. The question involved goes much deeper than that of injustice to a single person, since the refusal of enquiry strikes at the roots of a valuable principle of public life.

* * *

Buoying the Clouds

Certain extremely interesting experiments are in progress in France and Belgium, where the R.A.F. is maintaining a regular postal service between Marquise, near Boulogne, and the headquarters of the Armistice Commission at Spa, and on to Cologne. This through service to Cologne, apart from the distance, presents peculiar difficulties not met with on the frontier routes. Between the flat country of Northern France and the valley of the Rhine there lies a range of hills, rising in places to 2,000 ft. Not only does the country possess very few suitable landing places, but clouds and bad weather invariably collect round this *massif*. A chain of wireless stations has been organised for the transmission of weather reports. In the event of a forced landing the pilot communicates his situation to the nearest wireless station, which passes on the information to the most accessible R.A.F. or Army unit, and transport is immediately despatched to pick up the mails and render what assistance is possible. Where a pilot loses his way by reason of clouds or other difficulties arrangements are being made whereby he will be able to get into touch with a directional wireless station, whence he will receive details as to his actual bearings. These stations will also direct pilots to the nearest landing ground and guide him during night flying. In connection with the service a chain of balloons has also been arranged. Each section is to maintain a balloon in the air during daylight, and later on it is intended to fit these balloons for carrying signal lights by night. These balloons are to serve several purposes :—

1. To provide "air buoys" above the clouds to mark the landing grounds. Each balloon is marked with signs which indicate its exact locality, and thus enable the pilots to check their bearings when weather is bad or clouds are very low.

2. To enable the balloon observers to ascertain the height and thickness of clouds and condition of weather above the cloud layer.

3. To take the speed and direction of wind at the greatest possible altitude, and to note changes of direction. These observations are then passed to the nearest wireless station for transmission.

As the intention is to maintain a night service on this route, a chain of lighthouses has also been provided. At present the service is experimental, and owing to the nature of the country and the time of year, in which the conditions are the worst possible, the trial is a very practical test and should provide exceedingly valuable experience in meeting the difficulties that are certain to be encountered in eventual civilian and postal services. So far as we know this is the first regular service of the kind in which a real attempt has been made to bring the conditions into line with those of marine navigation, and it will be more than a little interesting to note the results when, later on, the full data are available. In thus taking the lead in experiment the R.A.F. are doing an excellent work for the future of aerial navigation, work which can admittedly only be done by the Force, which has at its disposal the machines and the *personnel* to make the experiments on a scale large enough to be ultimately useful. As we have insisted on previous occasions, it is along these lines of experiment that it is the business of the Air Ministry, in its capacity of the controlling department of civil aviation to proceed and we can only view with the profoundest satisfaction the fact that it is thus alive to its responsibilities in this direction.

* * *

An Aerial Lloyd's Registry

One of the first esentials in the development of aerial transport is a good system of registration and insurance, similar to that of Lloyd's in relation to merchant shipping. It is now an open secret that this is to be inaugurated almost at once and before very long the "Aerial Lloyd's Registry" will be actually in existence. Exactly what the scope of this organisation is likely to be we do not know at the moment, but it will doubtless carry out precisely the same functions in regard to aircraft as Lloyd's does in the case of shipping. Obviously, the first thing to be done is to get together the most competent constructional experts in order that a concrete scheme of classification of aircraft may be evolved. When that has been done, it will be time to issue a definite set of regulations under which all aircraft must be built in order to qualify for registration—and we assume that every machine will be compelled to possess a Lloyd's certificate as a necessary antecedent to insurance by Lloyd's underwriters. We may say at once that we much prefer such a system to that of rigid Government supervision of construction, such as some have predicted would be insisted upon. The Lloyd's system has worked admirably in the case of shipping—it could not have been bettered—and there is no reason in the world to suppose that in relation to aircraft it will not work equally well, both from the point of view of the public safety and from that of the aircraft industry. Indeed, we are very much inclined to the opinion that the name of Lloyd's will carry even more confidence than that of a Government department since an insurance at Lloyd's is a question of pounds sterling in relation to stability of construction, which is a matter which is understood by all.

Then, it is reasonably certain that the insurance rates levied by Lloyds are likely to be much lower in the case of machines built to its own requirements

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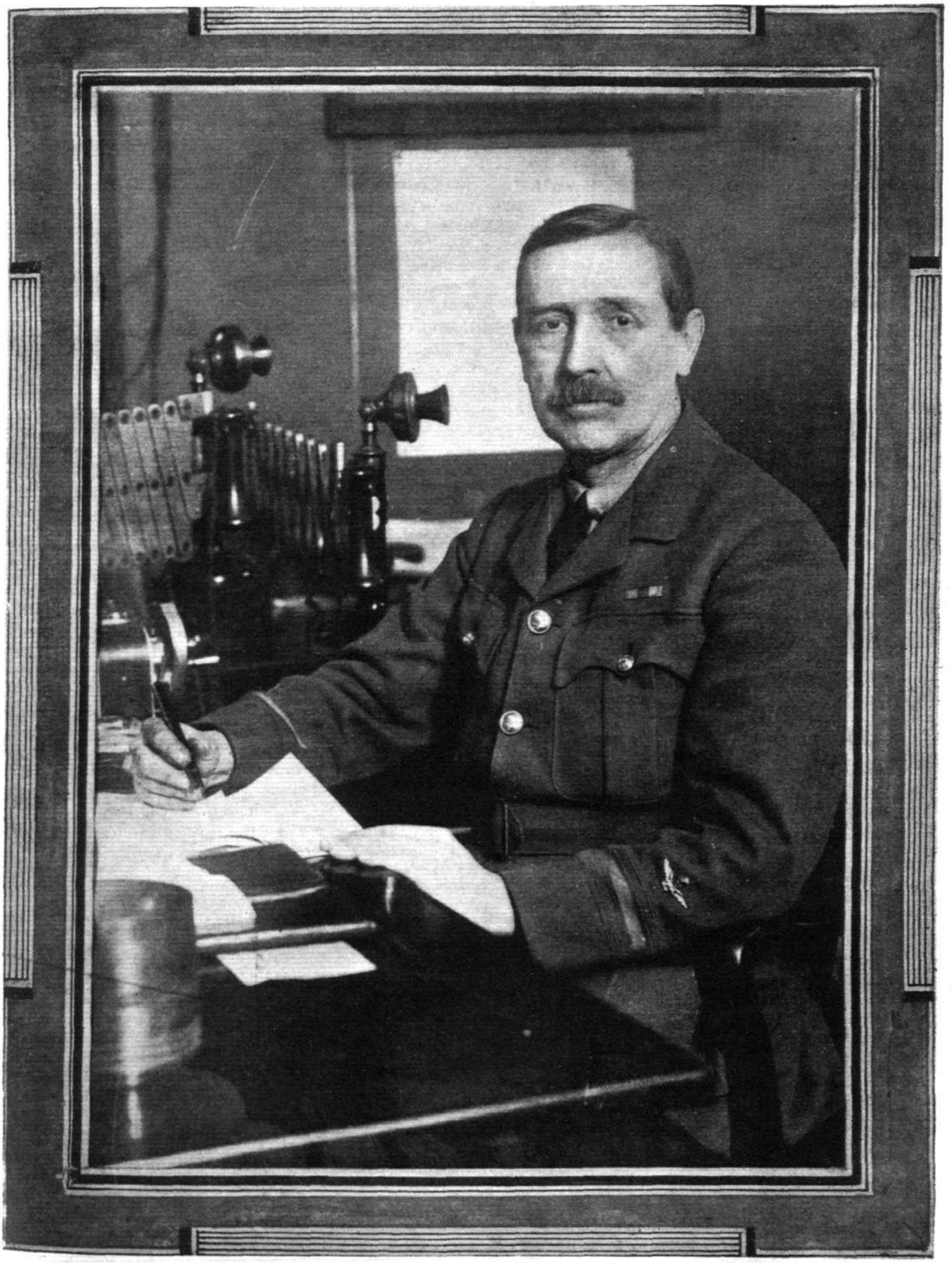
Flight—And the Men



"Flight" Copyright.

Brigadier-General R. K. BAGNALL-WILD, C.M.G., Controller of the Aircraft Inspection Dept.

and under the supervision of its own surveyors than they would be in that of aircraft constructed under other control. Again, there is the question of the establishment of an aircraft pilots' register, similar to the captains' register, which has been a feature of Lloyd's for a great number of years. This again has a marked bearing on insurance rates. By means of the register, Lloyd's have a complete record of every captain's service, and this enables the underwriters to keep an eye on shipmasters who are unlucky in the matter of accidents and to discriminate against ships under their command. It may be bad luck for the captains concerned, but it certainly assists the safety of navigation. So it would be in the case of aircraft pilots. There are some who are markedly unfortunate in the matter of crashes, either through carelessness or sheer bad luck. From the standpoint of public safety it is these who should be eliminated, and no more certain way could be devised of so eliminating them from active service than that of discriminating insurance rates. From every point of view, then, the proposed new Registry is to be welcomed as an excellent institution for both aviation and the general public.

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The Control of the Air

According to the *Daily Mail's* correspondent in Paris, the Aerial Advisory Commission of the British Peace Delegation has arrived at almost complete unity of ideas with the French on the scheme they propose for the control of air traffic throughout the world. One abuse which the scheme takes steps to prevent is the levy of excessive tolls at the expense of international air traffic. A State which happened to lie along a suitable flying route might be tempted to extort very heavy tolls from foreign aircraft. To obviate private speculation to the detriment of international air traffic, it is proposed that nations should agree to apply, if necessary, to ground suitable for aerodromes the principle of expropriation already in force for railway construction. This appears to be the soundest possible suggestion for dealing with an aspect of air traffic which would almost of a certainty give rise to considerable trouble if the proper steps were not taken in time to combat what might easily become a grave abuse.

The question of the use of aircraft for smuggling and crimes of violence has also been fully considered by the Commission. With regard to smuggling, the British experts seem to be of opinion that control will have to be exercised on the ground. The scheme proposed is a " bottle-neck " entry into each country—that there should be prescribed places where every machine entering that country will have to land for customs inspection and control. At this " control " its papers would be stamped, and it would be the function of the police in every part of the country to examine the papers of any " foreign " machine landing in their district and see that they bore this stamp. If they did not, the machine would be impounded and the pilot placed under arrest. That is all very well as far as it goes, but the air offers an enormous space for transport, and the Commission seems to realise that this will encourage smugglers to try to avoid the controls. The form suggested for a preventive system is a series of sound-detecting instruments along the coasts, linked up by telephone with each other, and with flights of aerial police farther inland. As for the aerial criminal, the protection against him will, it is suggested, be squadrons of expert fighting airmen, who will hunt him ruthlessly down.

We take it that it will in fact be necessary to take a certain amount of precaution against crime in the air, but it seems to us that the essential measures can be better taken on the ground than in the air. We certainly do not want to live in a state of perpetual aerial war, which is what the vision of " squadrons of expert fighting airmen " seems to predicate. There will always be criminals in every land, but it really looks as though the Commission were running the risk of exaggerating the danger to be anticipated from the class. The best safeguard would seem to lie in a rigid system of registration and identification of machines and pilots. Properly carried out, such a system as we have in mind would render the criminal career of an apache of the air a very short one indeed. The Commission is perfectly right to give this aspect of aerial traffic its close attention, but, if its views are correctly reported, it appears to have rather " got the wind up " regarding the whole question of the aerial Raffles. Otherwise, its conclusions seem to be eminently sound, and it is more than satisfactory to know that it is well on the way to the formulation of a workable code of international regulations.

AS SEEN FROM OUR AIRCRAFT.—A coastal motor-boat at speed.

FLIGHT

THE 200 H.P. BASSÉ-SELVE AERO ENGINE

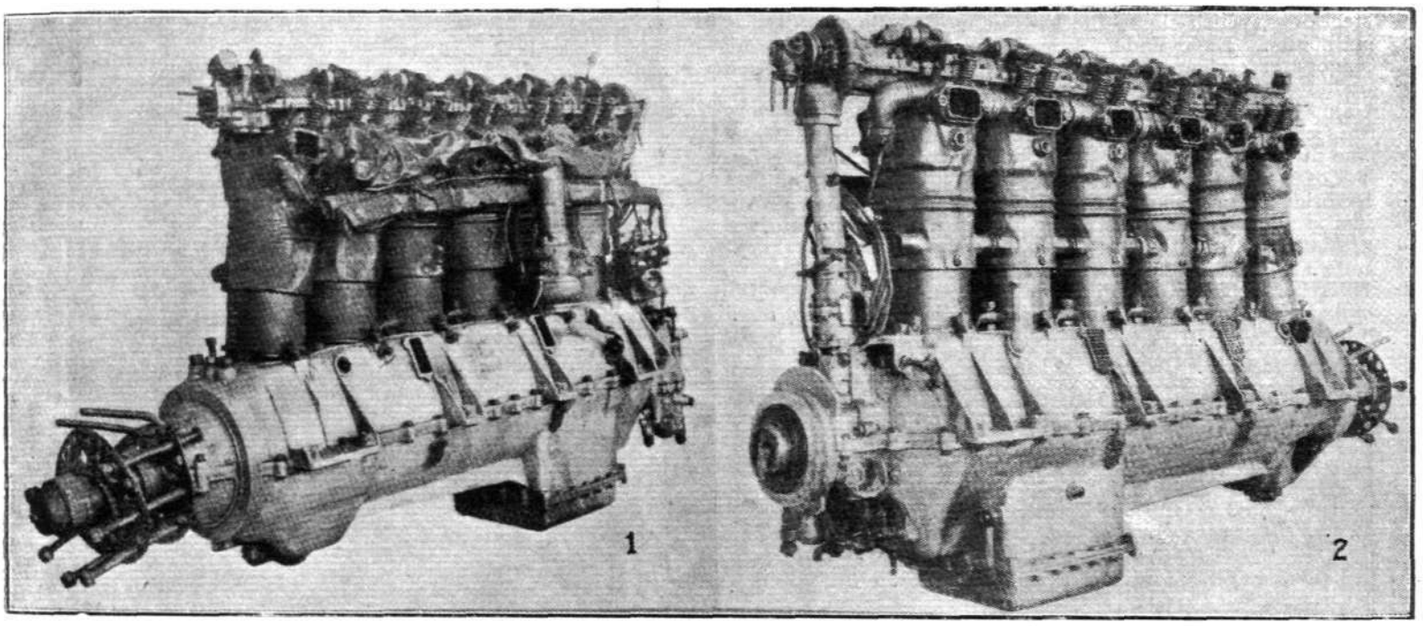
[*Issued by Technical Department (Aircraft Production), Ministry of Munitions*]

Introductory Note

THE following report on the design of the 270 h.p. Bassé-Selve engine is based on a detailed examination of the engine (No. 550) taken from the remains of a German Rumpler two-seater biplane (R.A.F. identification No. G/5BD/14), which was shot down and destroyed in France on May 31, 1918. Unfortunately, this is the only engine of its type which has been captured up to the time of writing, and as it was seriously damaged, it is impossible to carry out any power and consumption tests of the engine: consequently the following report deals with design and construction only. Certain figures connected with the performance have, however, been calculated by assuming the engine speed and brake mean effective pressure to correspond approximately with those of other German engines of about the same capacity. The figures adopted for these items are as follows:—

Normal engine speed .. .. 1,400 r.p.m.
Normal B.M.E.P. at 1,400 r.p.m. .. 110 lbs. per sq. in.

All the figures in the data at the end of this report, which are based on the above assumption (and therefore only to be accepted with reserve) are marked with an asterisk. Actual figures and test reports on the running of these engines will be issued as soon as an engine of this type is captured in good condition.



THE BASSÉ-SELVE ENGINE.—1. Induction side. 2. Exhaust side.

General Description

These engines, manufactured by Basse and Selve, Altena, Westphalia, have but recently appeared in the field. In most of their leading details of construction they closely resemble both the 260 h.p. Mercedes and 230 h.p. Benz engines, on which the design is evidently based. Markings on the engine indicate the year of manufacture to be 1917, the crankshaft being marked "A.G. Krupp, Essen, 1917." The nominal rating of the engine according to a cast plate on the crankcase is 270 h.p., and the normal engine speed would probably be about 1,400 r.p.m. Assuming the B.M.E.P. to be 110 lbs. per sq. in. at 1,400 r.p.m., the power developed would be approximately 269 b.h.p.

The accompanying photographs show the engine to be of the usual six-cylinder water-cooled type, the bore being 155 mm. and the stroke 200 mm., *i.e.*, 5 mm. less in the bore and 20 mm. longer in the stroke than the 260 h.p. Mercedes engines. Owing to the damaged condition of the cylinders and pistons it has been difficult to ascertain the exact clearance volume. This is approximately 1,130 c.c., giving a compression ratio of 4.34 : 1, which is lower than any of the previous enemy engines. Twin inlet and exhaust valves are fitted in the head of each cylinder, and the method of water cooling the exhaust valve stems by an annular passage, which completely surrounds the valve stem guides, is a novel detail of construction in enemy engines. The valves are operated by an overhead camshaft, running in bronze bearings in a cast aluminium casing; the design of the valve rockers and valve gear is worthy of notice. An unusual type of compression release gear is used, which is of remarkably simple construction. Aluminium pistons are fitted. These are machined all over, inside and out. The slightly convex crowns are supported by conical pillars which bear upon the centre of the gudgeon pins through the slotted small ends of the connecting rods. This construction, together with the design of the tubular connecting rods, is essentially Benz practice, whilst the construction of the steel cylinders is taken from the 260 h.p. Mercedes design, but incorporates several improvements.

A large oil-cooling radiator is attached to the bottom of the crankcase, and is used in conjunction with a new design of duplex-plunger oil pump, which works vertically at the rear end of the crankcase. The design of the oil pump is somewhat similar to that now used on the new 200 h.p. Austro-Daimler engines. Two separate two-jet carburettors fitted with annular floats are employed. These are apparently equipped with some form of altitude adjustment. Unfortunately, only one incomplete carburettor was found on the engine, the parts of which are shown in Fig. 20. No details can be given of the construction of the water pump, as this component was missing from the engine. The crankshaft is of ordinary, but exceptionally heavy design. The main journal bearing shells are machined with a screw-thread bedding for the white metal linings in a similar manner to the 300 h.p. Maybach engines. The propeller hub is fitted to a detachable tapered extension piece, which is bolted by a flange to the end flange of the crankshaft. Further details of the design are given in the following description, and the leading particulars of the engine are given in the accompanying data, which are as complete as the condition of the engine allows.

Details of Construction

Cylinders

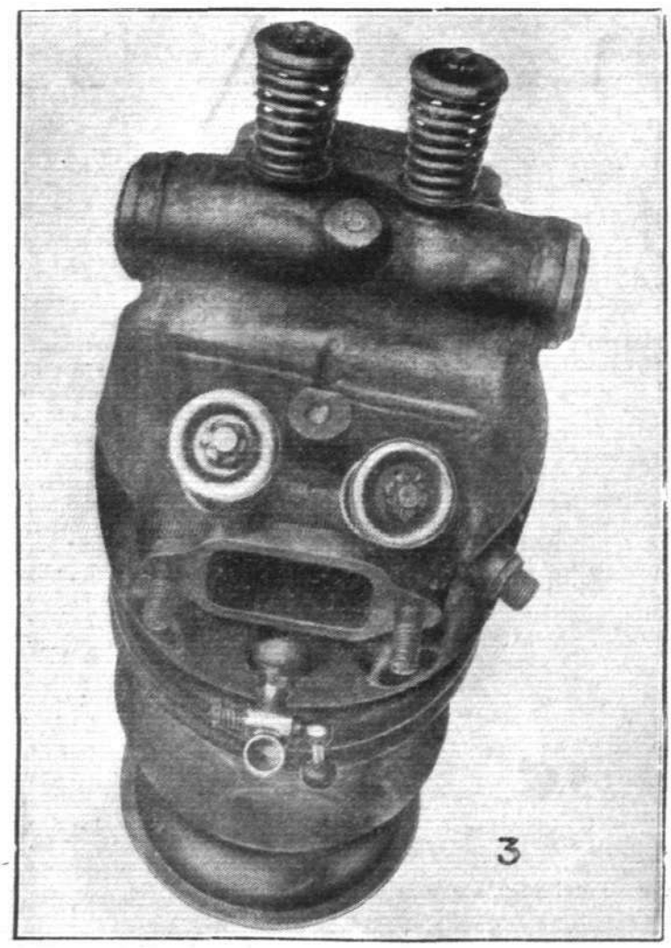
A sectional drawing showing most of the construction of the steel cylinders is given in Fig. 6. The cylinder barrels are screwed into the heads and welded in position. This construction is similar to the 260 h.p. Mercedes, as also are the eight ribs machined on the outside of the barrels. The cylinder heads are of cast steel, and the four valve pockets in each cylinder are cast integrally with the head. The formation of the combustion chamber and the unusual inclination of the valves at 23.5 deg. to the vertical axis of the cylinder are interesting points. The formation of the water

passages in the heads and the construction of the water jackets have evidently received the most careful consideration in this engine, especially in the cooling of the exhaust valves. The cylinder water jacket capacity is remarkably high, and the water passages through the cylinder heads are exceptionally good. The water connections between the cylinders are all on the exhaust valve side, and are of large diameter. The water connections in the cylinder heads are arranged as close up to the exhaust valves as possible.

The construction of the valve stem guides is as follows :—

The valve guides are steel tubes lined with phosphor bronze ; they are pressed into the valve pockets, and are acetylene welded in position top and bottom ; an annular passage cast in the exhaust valve pocket entirely surrounds the central portion of each exhaust valve stem guide for a distance of 35 mm. These passages are shown in the sketches, Figs. 4 and 5. The water jackets are of pressed sheet steel, with two angular corrugations, and the bottom joints of the water jackets are welded to bevelled flanges turned on the outside of the cylinder barrels. This joint is of the same design as is now used in the 200 h.p. Austro-Daimler engines.

A water passage is cast in the cylinder heads between each pair of exhaust valves, as shown in Fig. 5, which allows of water circulation completely around the head of each exhaust valve, and the exhaust valve stems are completely water cooled. The cylinders are bolted down to the crankcase by steel dogs, which clamp the base flanges of the cylinders at six points. The cylinders are registered in the crankcase by spigots extending 8 mm. below the base flanges. Each cylinder is held down at six points by means of dogs which clamp the cylinder base flanges on each side. These dogs are secured by studs screwed into the top half of the crankcase. The main journal bearing bolts, which pass through the top half of the crankcase, are also used to hold down the cylinders by bridge clamps between each pair of cylinders, as shown in the photograph. The lower halves of the main bearings are integral with the bottom half of the crankcase. Locknuts are screwed on the upper ends of the main bearing bolts beneath the cylinder holding-down dogs, so that the cylinders can be removed without disturbing the main bearings.

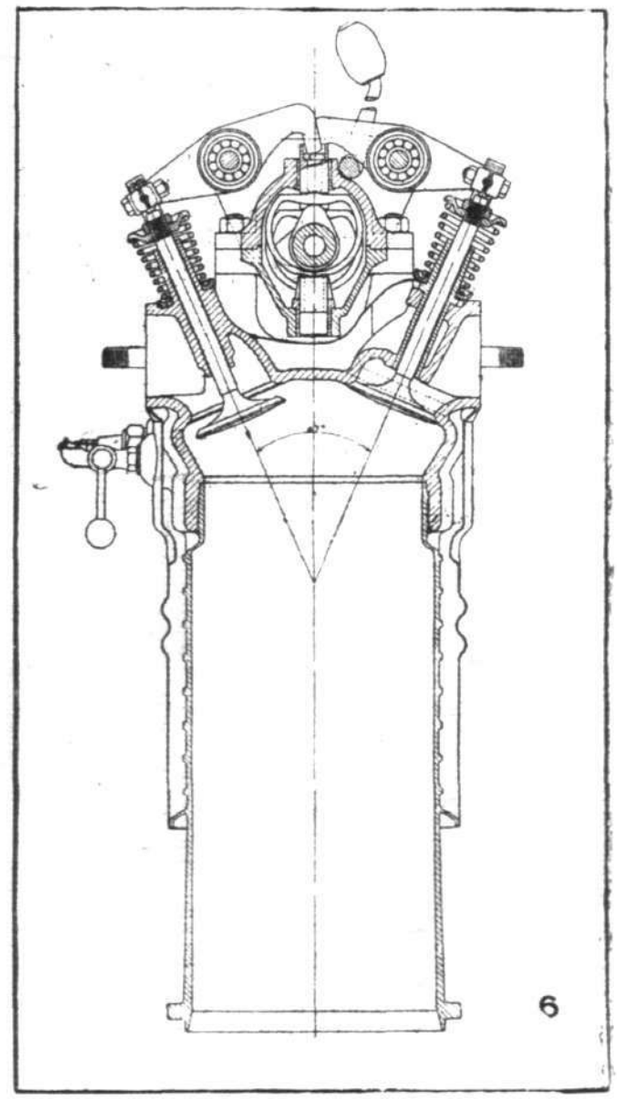


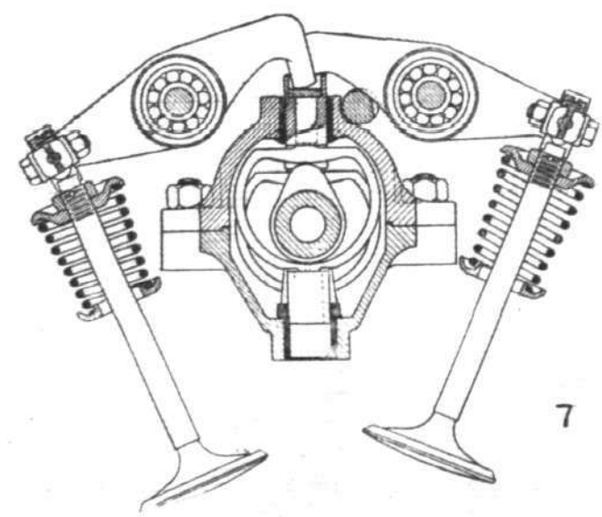
BASSÉ-SELVE ENGINE.—3. View of Cylinder.

Valves

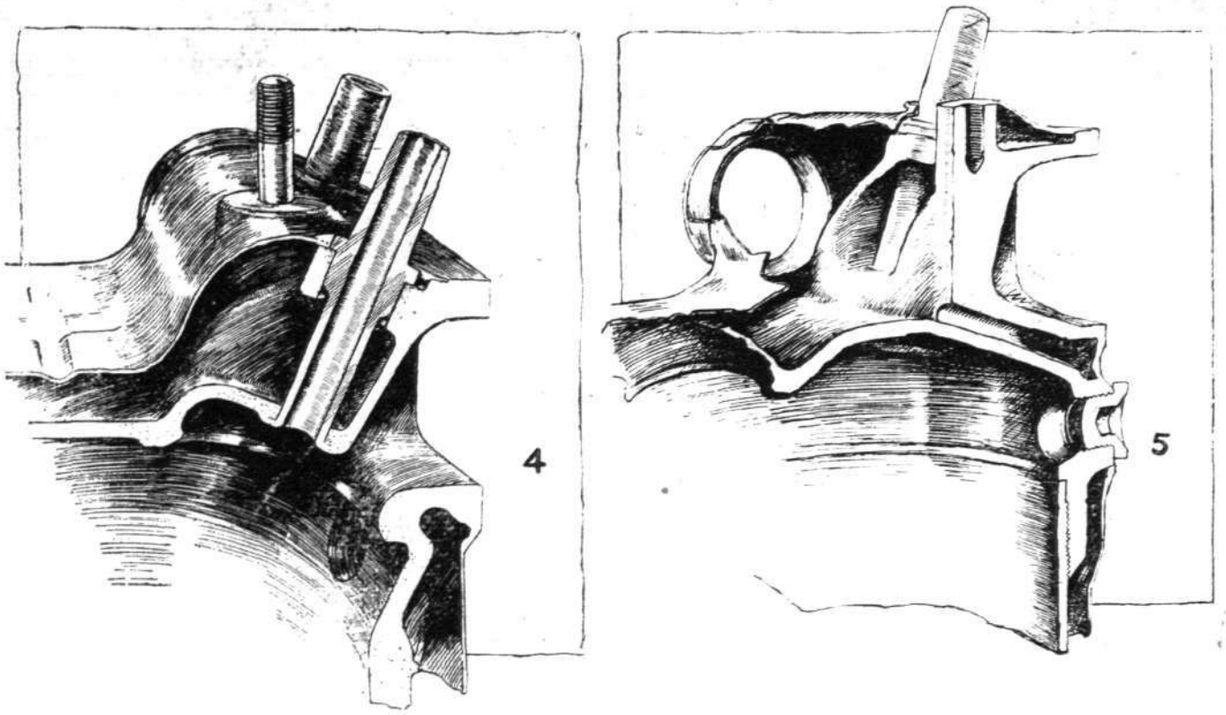
The inlet and exhaust valves are of the same diameter in the heads and stems, and of similar section. The valves measure 61.0 mm. across their slightly convex heads. The effective diameter of the valves at the valve seatings is 56 mm. The valve seatings of each pair of valves merge into single inlet and exhaust ports in the cylinder heads. These are rectangular, and the passages are remarkably short and free.

Single valve springs are fitted to each valve, and the wire

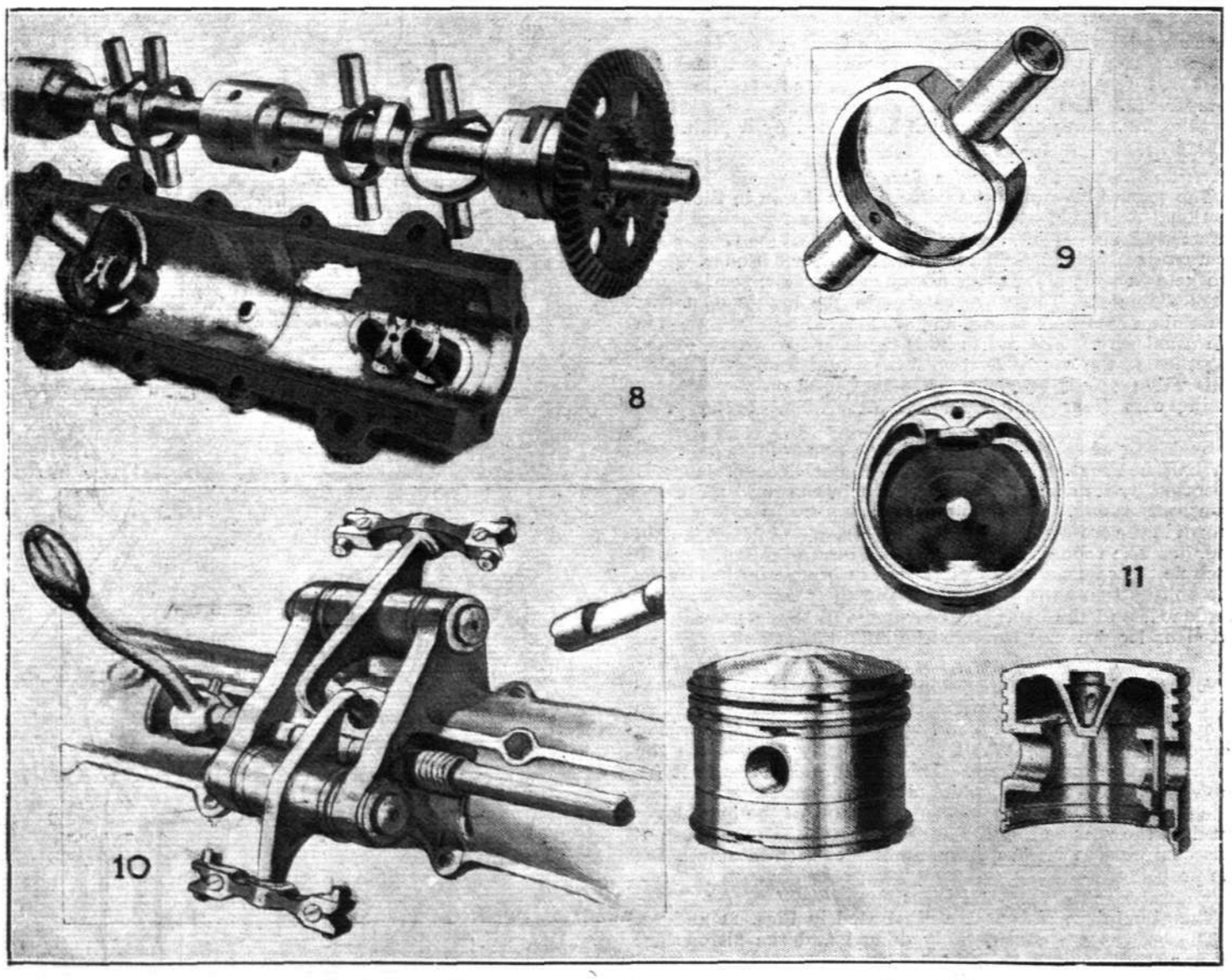




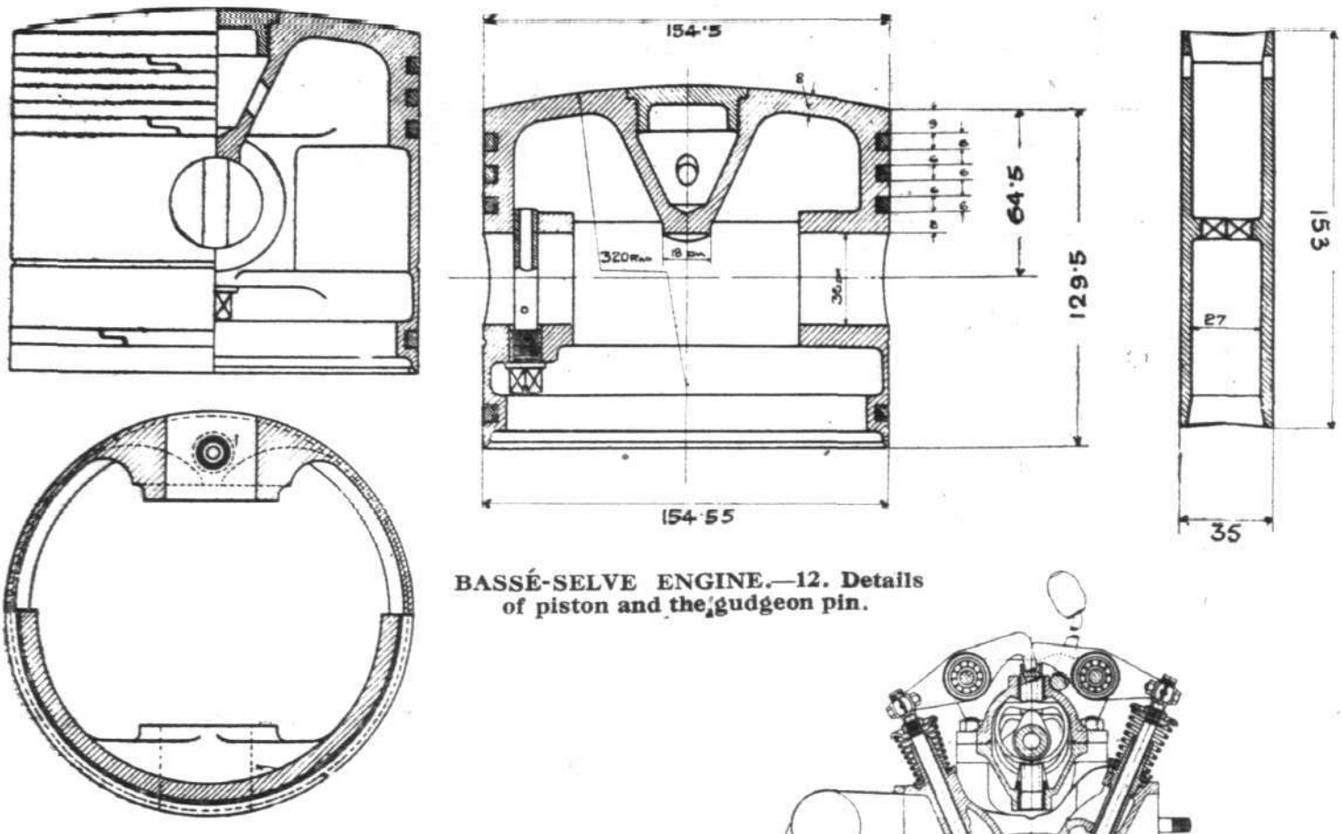
THE BASSÉ-SELVE ENGINE.
6. Section of cylinder.
7. Details of valve gear.



BASSÉ-SELVE ENGINE.—4. Sketch of water-cooled exhaust valve seatings. 5. View of water-cooling passages round exhaust valve guides.



THE BASSÉ-SELVE ENGINE.—8. Cam-shaft and tappets. 9. Sketch of tappet. 10. View of compression release gear and valve rockers. 11. Three views of aluminium piston.



BASSÉ-SELVE ENGINE.—12. Details of piston and the gudgeon pin.

for the springs is of light gauge (approximately 4.0 mm. diameter). The same design of valve spring is used for both inlet and exhaust valves, but the exhaust springs are more compressed. The ends of the valves stems are screwed to take the spring collars, which are locked by a plain castellated locking nut and split pin.

Valve Gear

The general lay-out of the valve gear is shown in the cross-sectional arrangement drawing, Fig. 13, and presents some interesting details of design. The camshaft runs in eight comparatively short plain bearings of phosphor bronze, which are held in split aluminium housings of hollow section and large diameter. These are carried in the halves of a cast aluminium camshaft casing, and are located by dowel pegs in the usual way. The camshaft is made in two parts, joined together at the centre by two flanges and four short bolts. This valve gear is very similar to that used on the Peugeot racing cars (four valves per cylinder) about seven years ago.

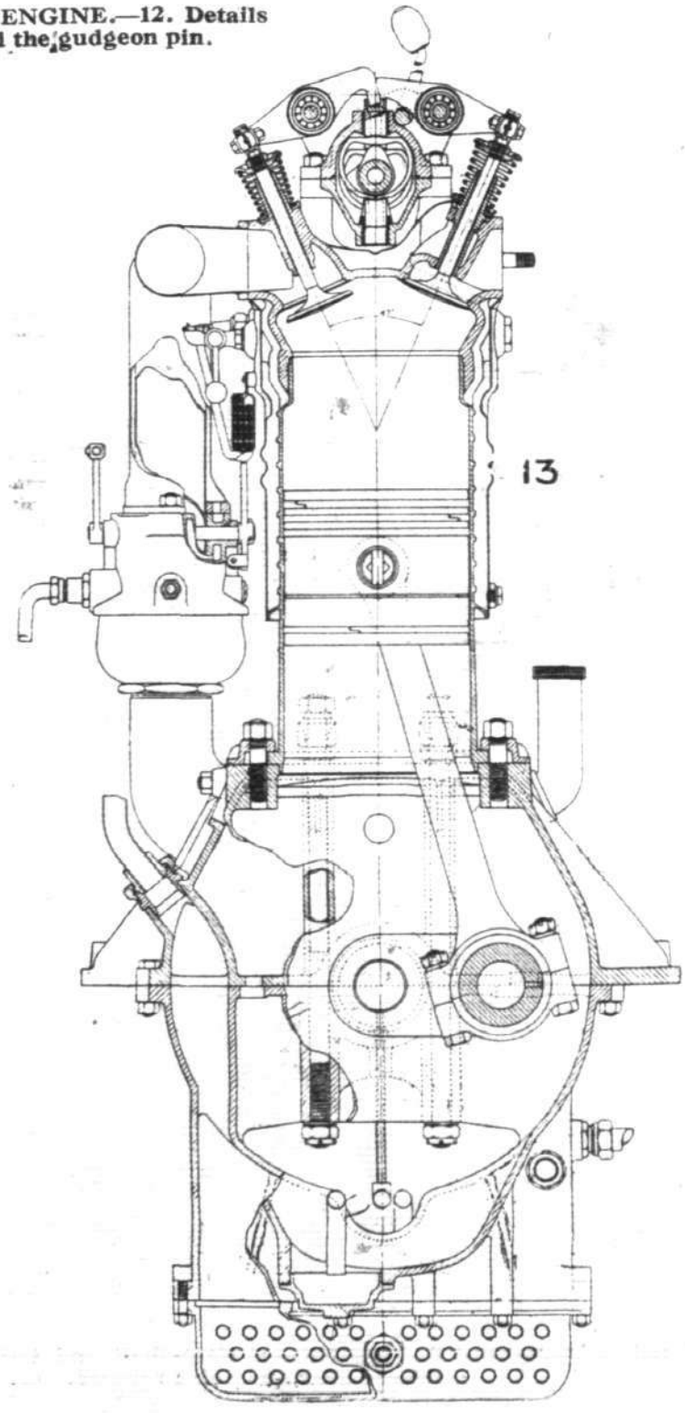
Each pair of valves is depressed by a rocker lever mounted on ball bearings. The inner arm of each rocker lever is operated by its cam through a tappet in the top half of the camshaft casing. The design of these tappets is clearly shown in the cross-sectional drawing, Fig. 7, and in the sketch, Fig. 9. The tappets are made in the form of stirrups which encircle the cams, and are supported in bronze bushes at the top and bottom ends. The cams and their tappets are case-hardened, and the camshaft bearings and tappets are lubricated under pressure through the hollow camshaft.

Compression Release

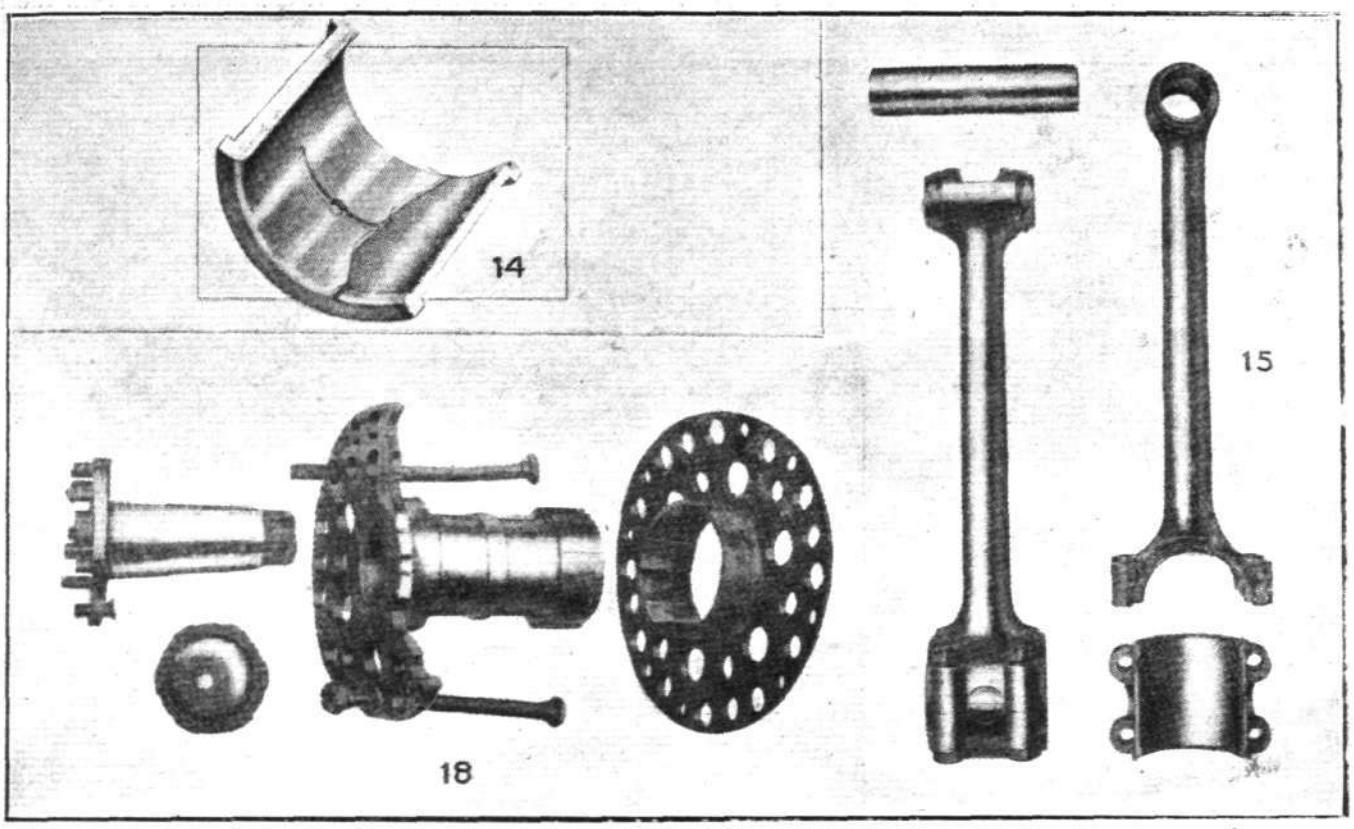
A simple form of compression release gear is used in place of the usual half compression cams and mechanism. This is operated by means of a rod which lies horizontally along the outside of the camshaft casing directly underneath the exhaust valve rocker arms. This rod has slots cut in it (as shown in Figs. 6 and 10), which lift the exhaust valve rockers when the rod is partially rotated by means of the hand lever fixed to the rear end of the horizontal rod. The purpose of this compression release is apparently to facilitate swinging the propeller.

Pistons

The aluminium pistons are illustrated in Figs. 11 and 12. The crowns are considerably domed and the pistons are machined all over, both inside and out. Both the material and the machining are excellent. No ribs are formed on the inside of the pistons, the crowns being supported by a hollow conical pillar which bears on the centre portion of the gudgeon pin, as in the Benz and other engines. This conical pillar is integral with the piston crown. The inside of the pillar is machined through a hole in the centre of the crown which

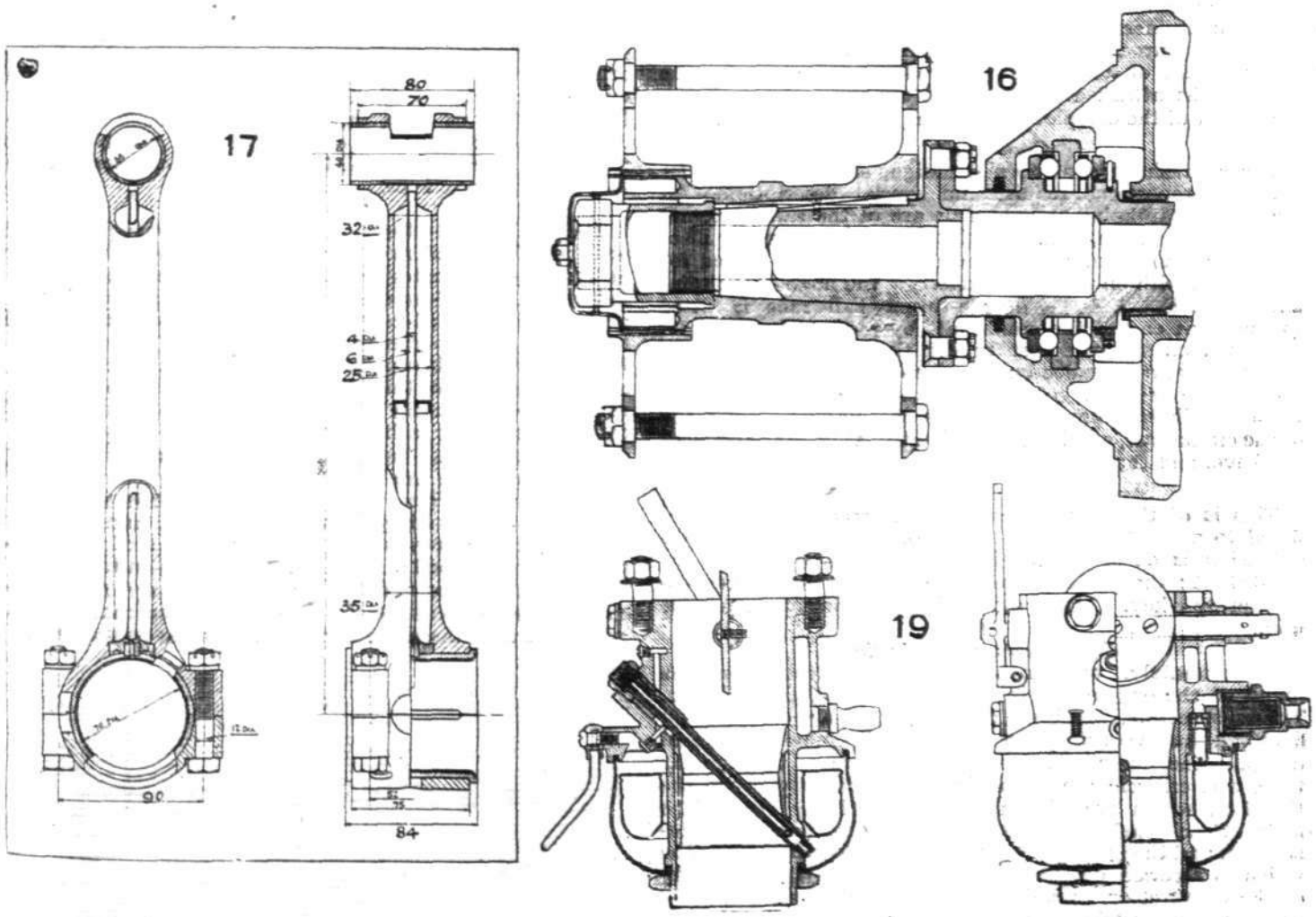


13. Cross-section of Bassé-Selve engine.



THE BASSÉ-SELVE ENGINE.—14. Sketch of big end bearing lining. 15. Connecting rods. 18. Propeller hub and detachable extension piece.

is afterwards plugged with a flanged cap screwed into the centre of the crown, as shown in the drawing. Three cast-iron compression rings are provided above the gudgeon pin and one at the bottom of the skirt, all with stepped joints. The machining processes of this type of piston are obvious from the illustrations. No bushes are provided as liners in the gudgeon pin bosses. The gudgeon pin is fixed in position by a large hollow set-pin which passes through both sides of the boss and gudgeon pin as shown. The weight of each piston complete with rings is 5.18 lbs.



THE BASSÉ-SELVE ENGINE.—17. Details of connecting-rod. 16. Section of propeller hub and thrust race. 19. Section of carburettor.

Connecting Rods

These are of tubular section, and closely resemble the Benz connecting rods in design, but are of considerably larger proportions throughout. The inner surfaces of the big-end shells are machined with a fine pitch screw thread to take the white metal liners as in the 300 h.p. Maybach engines. The crankshaft journal bearings are machined in a similar manner. Other details of the connecting rods may be seen in the photographs attached. These rods are particularly heavy, the weight of the complete connecting rod being 9.0 lbs.

Crankshaft

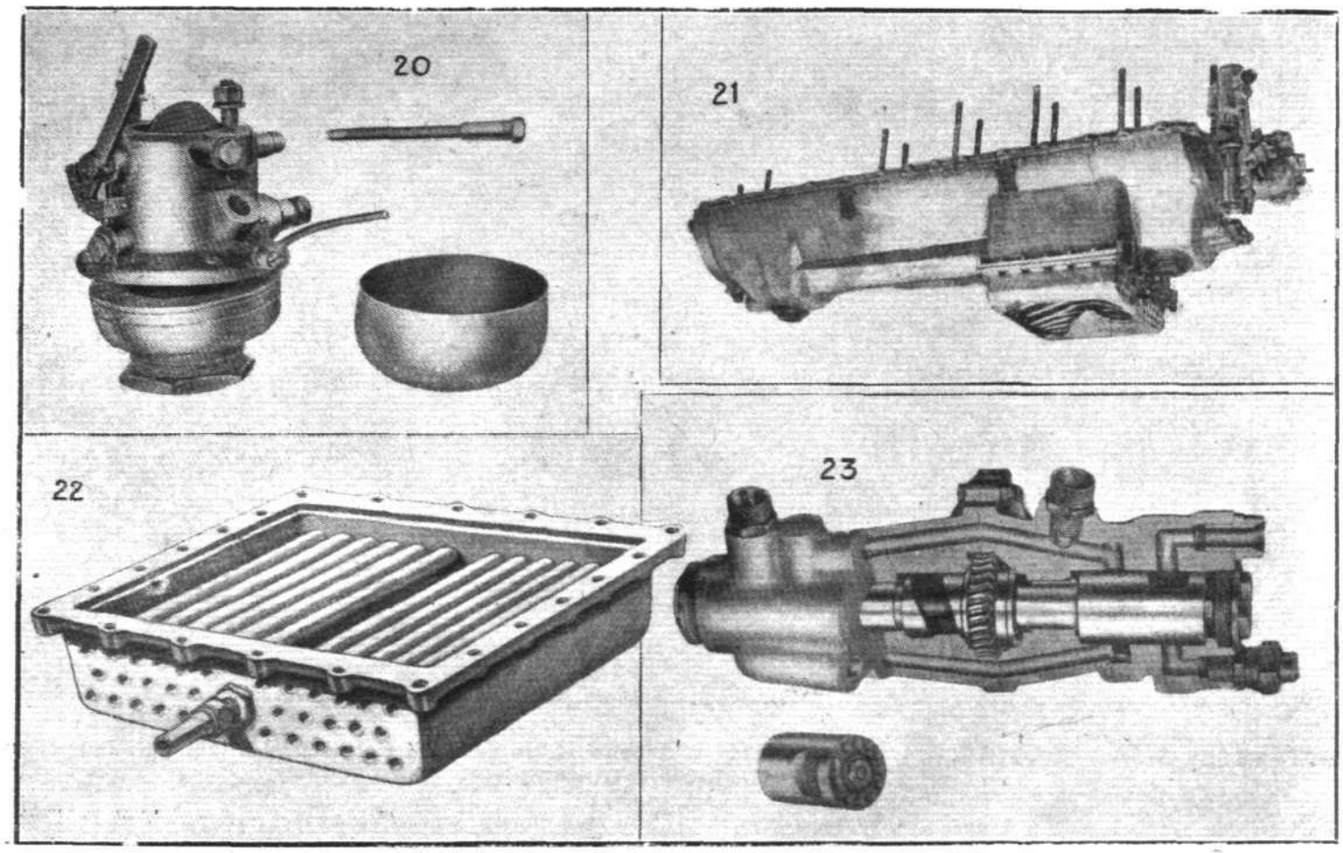
The crankshaft is of normal design, and apart from its massive proportions requires no special description. All the hollow crankpins and journals are of the same internal diameter (40 mm.), and are plugged with gunmetal discs expanded into grooves. All the crank webs are drilled for lubrication with oil passages connecting the hollow crankpins and journals. A large double-thrust ball race is fitted to the front end of the crankshaft by means of a shoulder machined on a flange just behind the propeller hub; the thrust races are threaded on over the cranks, and are secured by a large screwed collar and spring locking ring. The main distribution bevel gear floats on the splined rear end of the crankshaft, and is fitted with a thrust ball race between the bevel and the rear end of the journal bearing.

Propeller Hub

This is of the standard 260 h.p. Mercedes type, and is fitted to a short tapered extension of the crankshaft. This extension is detachable, being bolted to a flange on the crankshaft; the propeller hub is secured on the tapered extension by a key. The standard Mercedes locking device is used.

Carburettors and Induction

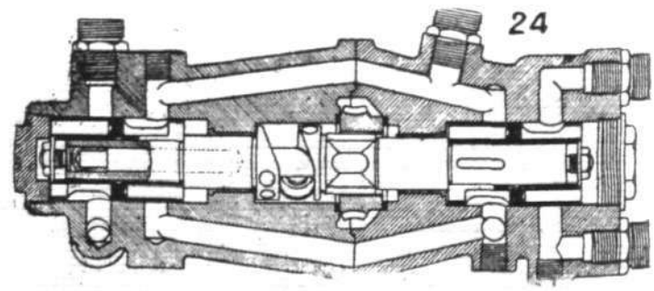
Unfortunately, only one incomplete carburettor was found on the engine. This is shown dismantled in Fig. 20. The carburettors, which are quite separate, are of unusually light and simple construction compared with previous German design. The floats and float chambers are of the annular type, and encircle the main air intakes directly below the throttles, which are of the ordinary butterfly type. The body of each carburettor and throttle is made of cast aluminium, and the main jet is formed by a hole drilled in a tube which is screwed diagonally into the water-jacketed body of the carburettor, and lies across the choke tube directly beneath the throttle. The jet tube is open at the bottom end, and projects into the bottom of the annular float chamber, which is made of pressed sheet steel of very light gauge. The pilot jet is formed by a second tube of small diameter inside the main jet tube. This pilot jet tube is also open at the bottom end, and is drilled radially with a small hole, just above the main jet. It communicates with the mixing chamber just above the throttle by a passage drilled in the carburettor body. An altitude compensating control is fitted. This takes the form of a pipe opening into a passage drilled in the top of the float chamber, and no doubt connected by a rubber tube to a control cock in the pilot's seat. Each carburettor feeds three cylinders through a branched induction manifold, the vertical part of which is water-jacketed. The total weight of each carburettor complete should not exceed 2 lbs.



THE BASSÉ-SELVE ENGINE.—20. Parts of carburettor. 21. Bottom half of crank-case, showing oil cooler. 22. Sketch of oil cooler. 23. View of sectioned oil pump.

Crankcase

The design of the top half of the crankcase requires no description, being constructed on Mercedes lines; it is shown in the engine photographs. The lower half also closely follows standard Mercedes design, with the exception of the oil reservoir and oil-cooling radiator on the bottom of the rear end. The construction of this cooler may be seen in Figs. 21 and 22; it consists of a cast aluminium oil chamber, having a number of thin aluminium tubes (12 mm. diameter) running longitudinally in three rows, and expanded at the ends. The cooler is bolted to the bottom flange of an oil reservoir below the base chamber, and is not an oil sump, inasmuch as there are no oil connections between it and the base chamber. This oil reservoir and cooler is provided for the purpose of forming the service oil tank, and for cooling the oil on the scavenger circuit; separate oil sumps are provided at each end of the base. (See notes on Lubrication.) For the purpose of refilling the supplementary oil tank and cooler a passage cast in the side of the base chamber communicates with the space between the transverse webs of the



24. Section of oil pump of Bassé-Selve engine.

main bearing housings. At the bottom of the crank chamber a trough is formed in the casting. This is semi-circular in cross section, and is provided to take the main oil supply and return pipes. Two air intake passages are cast on each side of the crank chamber, as shown in Fig. 21 ; they are arranged to communicate with the carburettor through passages in the top and bottom halves between the transverse box-housings of the main bearings.

Oil Pump and Lubrication System

The oil pump is attached to the bottom half of the crank-case at the rear end, and driven by a worm gear off the rear end of the crankshaft through a short transverse layshaft. Most of the details of construction of the oil pump may be seen in the photograph of the pump, Fig. 23, which has been specially sectioned to show as much as possible of the various oil passages, ports and connections. The pump consists of two double-acting steel plungers, which work vertically in the barrels formed in the ends of the cast aluminium pump body. In action, the plungers are rotated by means of the worm gear, and are simultaneously reciprocated by the action of the scroll-cam cut in the spindle (Fig. 24), and operated by a hardened steel roller working on a pin screwed into the pump body. At every stroke of the two double-acting plungers, oil is drawn from the cooler tank and sumps in the base chamber, and is delivered to the main bearings and camshaft or returned to the oil cooler respectively, through the four distributing ports in the pump plungers. These ports when in action coincide with the drilled passages in the body casting of the oil pump, which are connected to the various leads as shown in the lubrication diagram, Fig. 25.

The functions of the oil pumps and circuits are as follows :—

1. *Main Pressure Circuit*, by the two inner pumps to crank-shaft and connecting rod bearings and also to the hollow camshaft, returning by gravity to the two sumps at either end of the base chamber. The oil for this circuit is drawn from the supplementary oil cooler tank, which is replenished by fresh oil from the service oil tank.

2. *Scavenger Circuit.*—Oil is drawn by the two outer pumps from the two oil sumps in the bottom of the base chamber, and is returned to the oil cooler.

The total weight of the oil pump complete is 5.0 lbs.

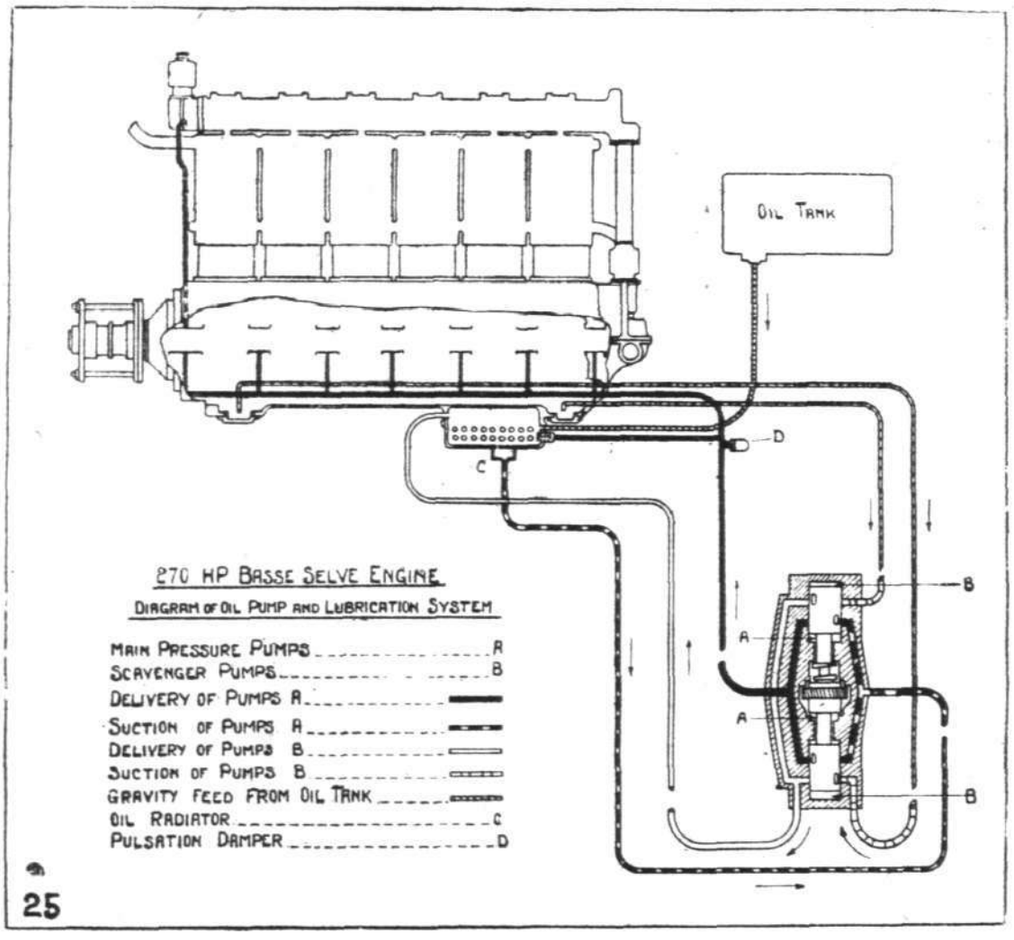
No details can be given of the construction of the water or air pumps, which were missing from the engine examined. The water pump, however, was evidently driven by the short transverse shaft which drives the oil pump at the rear end of the engine. This shaft is situated directly underneath the floating distribution bevel gear on the rear end of the crankshaft, as shown in the general arrangement drawing of the engine, Fig. 26, in which the oil pump, for the sake of clearness, is drawn on the exhaust side of the engine. The air pump, which was driven by a small crank fixed in the front end of the camshaft, was probably similar in design to the 260 h.p. Mercedes, and is shown thus in the general arrangement.

Ignition

Ignition is by two Z.H. 6 magnetos, which are driven obliquely to the crankshaft axis by bevel gears off the camshaft driving spindle at the rear end of the engine.

Two Bosch 3-point plugs are fitted to each cylinder, and are situated just below the induction valves. Provision is also made for fitting one sparking plug on the exhaust side of the cylinders, the holes not in use being plugged.

The H.T. cables are carried in fibre tubes attached to the cylinders.

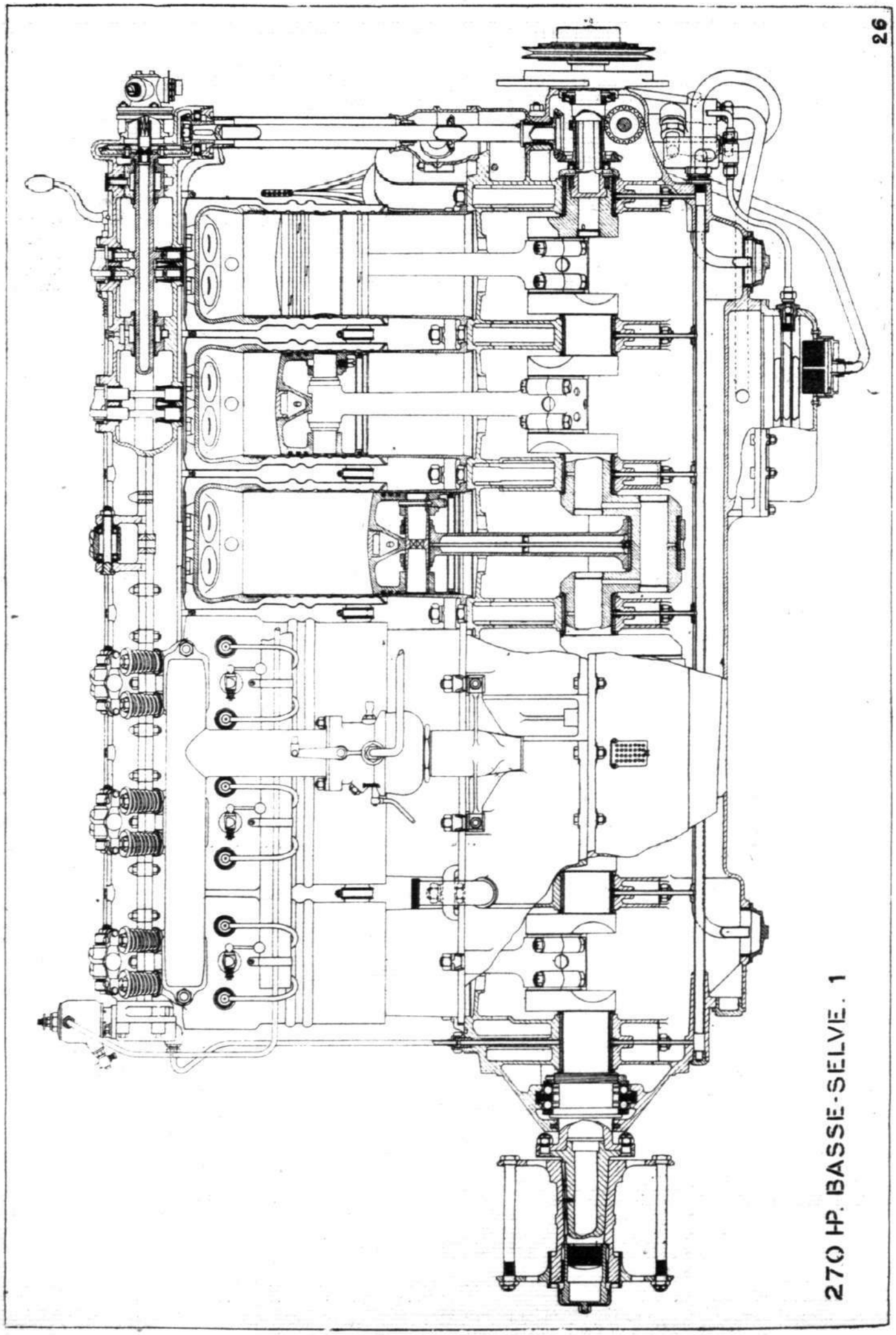


THE BASSÉ-SELVE ENGINE.—25. Lubrication diagram.

The machine-gun interrupter-gear triple drive is bolted to the camshaft bevel gear case, and is driven off the rear end of the camshaft as shown in Fig. 2. The "wireless" dynamo is driven off the rear end of the crankshaft by a standard type of friction-clutch belt pulley described in a previous report.

General Analysis of Weights

Description of Part.	No. per Set.	Average Unit Wt. lbs.	Wt. of complete Set. lbs.	Percentage of Total Wt.
Cylinders (bare)	6	35.67	214.05	24.20
Pistons, with rings	6	5.18	31.12	3.51
Gudgeon pins	6	1.00	6.00	0.68
Connecting rods	6	9.00	54.00	6.10
Crankshaft	1	138.50	138.50	15.65
Inlet valves	12	0.50	6.00	0.68
Exhaust valves	12	0.50	6.00	0.68
Inlet and exhaust valve springs	24	0.25	6.00	0.68



THE BASSÉ-SELVE AERO ENGINE.—Sectional general arrangement.

Valve collars and locking nuts	24	0.03	0.74	0.08
Valve rockers with bearings ..	12	1.43	17.22	1.94
Camshaft, with bearings ..	1	18.75	18.75	2.12
Camshaft tappets	12	0.31	3.75	0.42
Camshaft casing, with air pump and rev. counter drive ..	1	35.77	35.77	4.04
Vertical shaft driving spindle	1	4.50	4.50	0.51
Ditto, casing	1	2.30	2.30	0.26
Crankcase (top half)	1	97.50	97.50	11.09
Crankcase (bottom half) ..	1	112.00	112.00	12.67
Propeller hub, complete ..	1	29.43	29.43	3.33
Carburettors	2	2.00	4.00	0.45
Induction pipes	2	2.00	4.00	0.45
Oil pump	1	5.00	5.00	0.56
Oil leads	1	4.56	4.56	0.51
Magnetos	2	14.37	28.75	3.25
High tension leads and case ..	2	2.12	4.24	0.48
*Water pump (estimated) ..	1	8.00	8.00	0.90
*Exhaust manifold (estimated)	1	15.00	15.00	1.70
Miscellaneous parts	1	27.82	27.82	3.15
Total ..			885.0	100.00

General Data

Type number, No. 550; number and arrangement of cylinders, six, vertical; bore, 155.0 mm. (6.10 in.); stroke, 200.0 mm. (7.87 in.); Stroke/bore ratio, 1.29 : 1; area of one piston, 188.7 sq. cm. (29.24 sq. in.); total piston area of engine, 1132.2 sq. cm. (175.44 sq. in.); stroke volume of one cylinder, 3774.0 cub. cm. (230.21 cub. in.); total stroke volume of engine, 22644.0 cub. cm. (1381.28 cub. in.); clearance volume of cylinder, 1130 cub. cm. (68.96 cub. in.); compression ratio (approximate), *4.34 : 1; normal b.h.p. at 1,400 r.p.m., *269 b.h.p.; maximum b.h.p. at 1,600 r.p.m., *302 b.h.p.; direction of rotation of crankshaft and propeller, r.h.t.; type of valve gear, overhead camshaft; type of starting gear, compression release; weight of complete engine, dry, *885 lbs.; weight per normal b.h.p., ditto, *3.29 lbs.

Carburettors.—Number and type of carburettors, two, 2 jets; diameter of choke tube, 50.0 mm. (1.96 in.); bore of main jets, 2.59 mm. (0.0102 in.); bore of pilot jets, 1.17 mm. (0.0046 in.).

Valve Areas, Gas Velocities, etc.—Diameters—Induction pipe, 58.0 mm. (2.28 in.); inlet and exhaust effective valve ports (each), 56.0 mm. (2.20 in.). Cross sectional areas—induction pipes, 26.4 sq. cm. (4.10 sq. in.); inlet valve (π dh) and exhaust valve (π dh) (each), 17.6 sq. cm. (2.72 sq. in.).

Mean Gas Velocities (1,400 *r.p.m.*).—Piston speed, *1,837 ft. per min.; induction pipe, *219 ft. per sec.; inlet valve, *164 ft. per sec.; exhaust valve, *164 ft. per sec.

Inlet and Exhaust Valves.—Number per cylinder (each), two; largest diameter, 61.0 mm. (2.40 in.); effective valve port diameter, 56.0 mm. (2.20 in.); angle of seating, 45 deg.; lift of valve, 10.0 mm. (0.39 in.); diameter of stem, 11.0 mm. (0.43 in.); length of valve guide, 90.0 mm. (3.54 in.); overall length of valve, 146.0 mm. (5.74 in.); number of springs per valve, one; free length of spring, 80.0 mm. (3.14 in.); length of spring in position (no lift), inlet, 58.0 mm. (2.28 in.); length of spring in position (no lift), exhaust, 55.0 mm. (2.16 in.); mean diameter of coils (top), 36.0 mm. (1.41 in.); mean diameter of coils (bottom), 28.0 mm. (1.10 in.); diameter of wire, 4.0 mm. (0.157 in.); ratio, length of spring/lift of valve (inlet), 5.8 : 1; ratio, length of spring/lift of valve (exhaust), 5.5 : 1; weight of valve complete with spring, 0.75 lb.; weight of spring, 0.25 lb.

Inertia Forces, Bearing Loads, etc.—Weight of piston, complete with rings and gudgeon pin, 6.187 lbs.; weight per sq. in. of piston area, 0.211 lb.; weight of connecting-rod, complete, 9.00 lbs.; weight of reciprocating part of connecting-rod, 2.25 lbs.; total reciprocating weight per cylinder, 8.437 lbs.; weight per sq. in. of piston area, 0.288 lb.; length of connecting-rod (centres), 360.0 mm. (14.17 in.); ratio, connecting-rod/crank throw, 3.6 : 1; inertia lbs./sq. in. piston area: Top centre, 80.7 lbs. sq. in.; bottom centre, 45.7 lbs. sq. in.; mean, 31.6 lbs. sq. in.; weight of rotating mass of connecting-rod, 6.75 lbs.; total centrifugal pressure, 1,480 lbs.; centrifugal pressure, lbs./sq. in. piston area, 50.7 lbs. sq. in.; mean average fluid pressure, including compression, 44 lbs. sq. in.; mean average loading on crankpin bearing, total from all sources in terms of lbs./sq. in. piston area, 115.7 lbs. sq. in.; diameter of crankpin, 70.0 mm. (2.75 in.); rubbing velocity, 16.8 ft. per sec.; effective projected area of big-end bearing, 53.9 sq. cm. (8.35 sq. in.); ratio, piston area/projected area of big-end bearing, 3.50 : 1; mean average loading on big-end bearing, 405 lbs. sq. in.; load factor on big-end bearing, 6,800 lbs. ft.-sec.

Cylinders.—Depth of spigot at base of cylinder, 8.0 mm. (0.31 in.); thickness of flange at base of cylinder, 10.0 mm. (0.39 in.); number of holding-down studs per cylinder, six; diameter of holding-down studs, four of 16.0 mm., two of 14.0 mm.; thickness of water jacket, 1.0 mm. (0.039 in); mean thickness of combustion chamber wall, 7.0 mm. (0.27 in.); mean thickness of cylinder barrel, 3.0 mm. (0.118 in.).

Piston.—Types of piston, aluminium (convex crown); diameter of top, 154.5 mm. (6.08 in.); diameter of bottom, 154.75 mm. (6.09 in.); length, 130.0 mm. (5.11 in.); ratio, piston length/cylinder bore, 0.838 : 1; number of rings per piston, four; position of rings, three above pin, one below; width of rings, 6.0 mm. (0.23 in.); type of joint in rings, stepped.

Connecting Rod.—Length between centres, 360 mm. (14.17 in.); ratio, connecting/crank throw, 3.6 : 1; little-end bearing, type, phosphor bronze; little-end bearing, diameter, 35.0 mm. (1.37 in.); little-end bearing, length, 80.0 mm. (3.14 in.); little-end bearing, projected area, 28.0 sq. cm. (4.34 sq. in.); ratio, piston area/projected area of little-end bearing, 6.74 : 1; big-end bearing, type, bronze shell lined white metal; big-end bearing, diameter, 70.0 mm. (2.75 in.); big-end bearing, length (effective); 77.0 mm. (3.03 in.); big-end bearing, projected area, 53.9 sq. cm. (8.35 sq. in.); ratio, piston area/projected area of big-end bearing, 3.50 : 1; number of big-end bolts, four; full diameter of bolts, 12.0 mm. (0.47 in.); total cross-sectional area bottom of threads, (0.460 sq. in.); pitch of threads, 1.75 mm.; weight of big-end cap, with two bolts and bearing shell, 2.562 lbs.; total load on bolts at 1,400 r.p.m., 3,460 lbs.; total load on bolts at 1,600 r.p.m., 4,530 lbs.; stress per sq. in. at 1,400 r.p.m., 7,500 lbs. sq. in.; stress per sq. in. at 1,600 r.p.m., 9,850 lbs. sq. in.

Crankshaft.—Number and type of main bearings, seven bronze shell lined white metal; cylinder centres, 210.0 mm. (8.26 in.); crankpins—Outside diameter, 70.0 mm. (2.75 in.); inside diameter, 40.0 mm. (1.57 in.); length, 85.0 mm. (3.34 in.). Journals: Outside diameter, 70.0 mm. (2.75 in.); inside diameter, 40.0 mm. (1.57 in.); length (propeller end), 60.0 mm. (2.36 in.); length (rear end), 95.0 mm. (3.74 in.); length (intermediate), 63.0 mm. (2.48 in.). Webs: Width, 84.0 mm. (3.30 in.); thickness (front one), 37.0 mm. (1.45 in.); thickness (others), 31.0 mm. (1.22 in.) Radius at ends of crankpins and journals, 4.0 mm. (0.158 in.); weight of complete shaft, 138.5 lbs.; length of complete shaft, 820 mm. (38.28 in.).

Ignition.—Number and type of magnetos, two, Bosch Z.H. 6; firing sequence of engines, prop. 1, 5, 3, 6, 2, 4; number of plugs per cylinder, two; type of plugs, Bosch three-point; ratio, magneto speed/engine speed, 1.5 : 1.

Lubrication.—Number and type of oil pumps, one, duplex (double-acting); bore, 45.0 mm. (1.77 in.); stroke, 12.0 mm. (0.47 in.).

R.A.E. Metallurgical Report

Chemical Analysis

The chemical compositions of the crankshaft and piston are as follows:—

Crankshaft.	Per cent.	A 1. Piston.	Per cent.
Carbon	0.48	Silicon	0.45
Silicon	0.32	Iron	1.06
Sulphur	0.061	Copper	1.90
Phosphorus	0.016	Tin	Nil.
Manganese	0.32	Zinc	15.62
Nickel	2.59	Manganese	Nil.
Chromium	1.17	Aluminium (by diff.)	80.97
Vanadium	Nil		

Mechanical tests

Mechanical tests on the crankshaft gave values stated below:—

Mark.	A. Web. Longitudinal.	B. Web. Transverse.	C. Pin.
Diameter	.249 in.	.253 in.	.249 in.
Yield point, tons/sq. in.	44.6	44.5	46.3
Ultimate stress, tons/sq. in. ..	55.5	54.4	56.4
Elongation on 4 $\sqrt{A}$.	19.5 per cent.	12.8 per cent.	20.8 per cent.
Reduction of area	48 per cent.	24 per cent.	56 per cent.
Impact, ft. lbs. {	28	26	41
	25	25	41

THE ROYAL AERO CLUB OF THE U.K.

OFFICIAL NOTICES TO MEMBERS.

ANNUAL GENERAL MEETING

The Annual General Meeting of the Members of the Royal Aero Club of the United Kingdom will be held on Monday, March 31, 1919, at 3, Clifford Street, New Bond Street, London, W. 1, at 6 p.m.

Notices of motion for the Annual General Meeting must be received by the Secretary not less than 21 days before the meeting, and must be signed by at least five members. The last day for the receipt of notices of motion is Monday, March 10, 1919.

Committee

In accordance with the rules, the Committee shall consist of eighteen members. Members are elected to serve for two years, half the Committee retiring annually. Retiring members are eligible for re-election.

The retiring members of the Committee are :—

Lieut.-Col. John D. Dunville, R.A.F.
Lieut.-Col. Spenser D. A. Grey, D.S.O., R.A.F.
Brig.-Gen. Sir Capel Holden, K.C.B., F.R.S.
Lieut.-Col. A. M. Longmore, R.A.F.
Lieut.-Col. F. K. McClean.
Brig.-Gen. E. M. Maitland, D.S.O., R.A.F.
The Right Hon. Lord Northcliffe.
Lieut.-Col. Alec Ogilvie, R.A.F.
Maj.-Gen. Sir Godfrey M. Paine, K.C.B., M.V.O.

Any two members of the Club can nominate a member to serve on the Committee, provided the consent of the member has been previously obtained. The name of the member thus nominated, with the names of his proposer and seconder, must be sent in writing to the Secretary not less than fourteen days before the Annual General Meeting. The last day for the receipt of nominations is Monday, March 17, 1919.

FLYING SERVICES FUND COMMITTEE.

A Meeting of the Flying Services Fund Committee was held on Thursday last, February 27, 1919, when there were present:—Lieut.-Col. T. O'B. Hubbard, R.A.F., in the Chair, Mr. Chester Fox, Brig.-Gen. R. H. More, C.M.G., and Lieut.-Com. H. E. Perrin, R.N.V.R., Secretary.

Grants and Allowances.—The following Grants and Allowances were made :—

41. An allowance of £3 a month for six months to the mother of a Chief Petty Officer in the Royal Naval Air Service who had been killed on active service.

58. An allowance of £3 a month for six months to the widow of an Air-Mechanic in the Royal Naval Air Service who had been killed on active service.

67. An allowance of £1 10s. a month for three months to the mother of a 3rd Class Air-Mechanic in the Royal Flying Corps who had been killed on active service.

70. An allowance of £1 a month for six months to the mother of a 2nd Class Air-Mechanic in the Royal Flying Corps who had died on active service.

96. An allowance of £5 a month for three months to the mother of a 2nd Lieutenant in the Royal Flying Corps who had been killed on active service.

109. An allowance of £2 a month for six months to the widow of a Private in the Royal Flying Corps who had died on active service.

136. An allowance of £2 a month for six months to the mother of a Private in the Royal Flying Corps who had died on active service.

140. An allowance of £2 a month for six months to the widow of a 2nd Class Air-Mechanic in the Royal Flying Corps who had died on active service.

141. An allowance of £4 a month for six months to the widow of a Private in the Royal Air Force who had died on active service.

142. A Grant of £3 to the widow of a Private in the Royal Air Force who had died on active service.

143. An allowance of £3 a month for six months to the widow of a 1st Class Air-Mechanic in the Royal Air Force who had died on active service.

146. An allowance of £2 a month for six months to the widow of a 1st Class Air-Mechanic in the Royal Air Force who had died on active service.

148. An allowance of £1 a month for six months to the mother of a Private in the Royal Air Force who had died on active service.

152. An allowance of £2 a month for six months to the widow of a 2nd Class Air-Mechanic in the Royal Flying Corps who had died on active service.

153. An allowance of £3 a month for six months to the widow of a 2nd Class Air-Mechanic in the Royal Flying Corps who had died on active service.

155. An allowance of £2 a month for six months to the widow of a 1st Class Air-Mechanic in the Royal Air Force who had been accidentally killed on active service.

160. An allowance of £2 a month for six months to the sister of a 3rd Class Air-Mechanic in the Royal Air Force who had died on active service.

161. An allowance of £2 a month for six months to the mother of a Private in the Royal Air Force who had died on active service.

139. An allowance of £3 a month for six months to the widow of a 3rd Class Air-Mechanic in the Royal Air Force who had died on active service.

THE FLYING SERVICES FUND

(Registered under the War Charities Act, 1916)

Administered by the Royal Aero Club

For the benefit of *Officers, Non-Commissioned Officers and Men* of the Royal Air Force who are incapacitated on Active Service, and for the widows and Dependants of those who are killed.

Honorary Treasurer :
The Right Hon. Lord Kinnaird.

Committee :
Lieut.-Col. T. O'B. Hubbard, M.C., R.A.F. (*Chairman*).
Mr. Chester Fox.
Lieut. Col. Harcourt G. Gold, R.A.F.
Lieut.-Col. C. E. Maude, R.A.F.
Brig.-Gen. R. H. More, C.M.G., R.A.F.

Secretary :
Lieut.-Com. H. E. Perrin, R.N.V.R.

Bankers :
Messrs. Barclays Bank, Ltd., 4, Pall Mall East, London, S.W. 1.

Subscriptions

	£	s.	d.
Total subscriptions received to Feb. 18, 1919 ..	14,839	18	1
Amount collected at a sacred concert held on Sunday, February 16, 1919, per James F. Morris	5	0	0
South-Western Area Recreational Training Association, Headquarters, Royal Air Force Salisbury (Ninth contribution, making a total of £1,136 3s. 6d.)	50	0	0
Employés of Messrs. S. Sansum and Co., Eagle Works, Wolverhampton	5	2	10
Total, March 4, 1919	14,900	0	11

Offices : THE ROYAL AERO CLUB,
3, CLIFFORD STREET, LONDON, W. 1.

H. E. PERRIN, Secretary.

ROLL OF HONOUR.

Published February 24.

Died of Injuries

Heathers, Sec. Lieut. P. C.

Died

Garrod, Lieut. B. R.
Hill, Maj. A. P. D.
Suttle, Capt. W. P.

Published February 28.

Killed

Hammond, Sec. Lieut. H. C.
Hewett, Lieut. L. S.
Yokom, Sec. Lieut. C. F.

Died of Injuries

McLeod, Sec. Lieut. G. E.

Died

Birch, Lieut. E. C.
Lawson, Capt. H.

Published March 1

Killed

Brodie, Lieut. E. B.
Davies, Sec. Lieut. E. G., D.F.C.
Frost, Sec. Lieut. D. G.

Died of Injuries

Carlton-Smith, Sec. Lieut. B.

Died

Clifford, Lieut. C. H.
Halcombe, Maj. N. M.

Published March 3.

Killed

Bannister, Capt. E. G.
Fast, Sec. Lieut. J. B.
McGee, Lieut. E. J.

Died

Illingworth, Lieut. F. W.

FLIGHT

AERIAL SMUGGLING

BY CAPTAIN P. G. MARR, R.A.F.

SMUGGLING may be taken to denote a breach of the Revenue laws either by the importation or the exportation of prohibited goods or by the evasion of Customs duties on goods liable to duty. It is to these evasions of Customs duties that the aerial smuggler's activities will be chiefly directed.

In this article it is not proposed to deal at any length with the moral and legal aspects of smuggling by air. Those rulings which hitherto have applied to smuggling by sea and over frontiers would embrace the subject under consideration. Rather is it the writer's object to examine it with regard to its feasibility and the steps that could be taken to detect and prevent it.

As to the kinds of goods it would be possible to import by aerial smuggling, the chief essentials would be lightness, compactness, and high value in relation to weight and bulk, provided the import duties levied upon them were high in comparison with their original cost. Later on there may be changes in the schedule of taxable goods suitable for smuggling by air, but the tendency would be to add to their number.

It is well known that the War has been responsible for almost incredible progress in the knowledge and practice of aviation. It is true that these advances have been made almost entirely with the view to improving aeroplanes for war purposes; in fact, the results for which designers and manufacturers have aimed have been almost exclusively speed, climb, manœuvre and reliability, all of which are essential in war machines. But it must not be supposed that the various machines we see in the air every day, which were intended to fulfil these requirements when designed, will be the types employed for utilitarian purposes in the future.

During the War designers and manufacturers have been enabled to acquire limitless stores of knowledge of aeronautics in general, with Government footing the bill—knowledge which under ordinary peace-time conditions would have taken years and years of research and costly experiment to obtain. It may not be very long before the experience so gained will be applied to the production of commercial machines of various types and sizes, according to the work they will be required to do. Aerial achievement in the matter of cross-country flying is becoming a matter of common knowledge, and merchants will not be slow to avail themselves of aerial transport facilities for certain classes of goods, on the numerous occasions where speed is all-important. Cost of delivery will necessarily be of secondary consideration in such cases, for it must not be overlooked that aerial transport and aerial travel will be comparatively expensive at first, unless a far-seeing Government grants generous subsidies. As regards passenger-carrying, it should not be difficult to educate people to appreciate the advantages of this new and speedy means of travel. To become popular, however, aerial travel must also make an appeal to the pocket, and, above all, it must be reasonably safe. Otherwise its many advantages will be discounted, and voyages by air will be undertaken only by the well-to-do and the adventurous.

In due course, besides Service war machines, which constitute the bulk of aeroplanes now in existence, we may expect to see the following classes of aircraft in ever-increasing daily use :—

(1) Privately-owned machines for purposes similar to those of the motor car, namely, for sport or pleasure, to carry one or more persons.

(2) Machines piloted by special messengers or carrying special messengers.

(3) Machines for passengers and merchandise.

(4) Machines for passenger-carrying only.

(5) Machines for merchandise only.

(6) Special mail machines.

Many of those of the classes 3, 4 and 5 would also carry mails. In addition to the above, there would be various kinds of "dirigibles," *i.e.*, lighter-than-air machines of the Zeppelin and Schutte-Lanz order, as well as smaller craft such as our own "Blimp," so popular at seaside resorts. To these airships practically everything within the scope of this article would equally apply; but as the progress made in the use, construction and general knowledge of aeroplanes has far outstripped that of dirigibles, the tendency will doubtless be to popularise the aeroplane type. These notes should therefore be taken to apply more particularly to heavier-than-air machines.

It may not be out of place to state here, before considering smuggling methods and preventive measures, that the particular legislation designed with the view to preventing smuggling is contained in the Customs Consolidation Act of 1876 (39 and 40 Vict. c. 36, s.s. 169-217) the main provisions of which are briefly as follows :—Vessels engaged in smuggling are liable to forfeiture. Officers of Customs have a right of search of vessels and persons. Fradulent evasion or attempted evasion of Customs duties renders the offender subject to forfeit treble the value of the goods or £100 at the election of the Commissioners of Customs. Heavy penalties are incurred by resistance to officers of Customs, rescue of persons or goods, assembly to run goods, signalling smuggling vessels, shooting at vessels or boats or officers of the naval or revenue service, etc. There can be no doubt that the provisions of the Act here quoted would apply to aerial smuggling until special legislation were provided. A writer of 1887 on the legal aspects of smuggling stated that contracts to defraud the revenue of a foreign state were not, according to English decisions, illegal. He went on to say that there was a German decision, "more consonant with international morality," to the opposite effect. We were obliged to blush in 1887—but so many things have happened since!

The measures to be taken for the prevention and detection of aerial smuggling will vary with the class of smuggler to be prevented or detected. It is quite possible that the use of the first class of machine mentioned above will produce the private-owner-pilot smuggler or the pilot-smuggler accomplice of the private owner. His aeroplane would probably be a land machine, for by coming down in a seaplane anywhere on the coast he would be at once detected by our well-organised and vigilant coastguards. His greatest chances of success will be at the time when the preventive and detective measures are in their experimental stages. Later on these will become highly organised, but their value can only be judged by the measure of success they achieve in making smuggling too risky an occupation in relation to its rewards. The comparatively high cost of aircraft and the expense of maintenance will have a considerable influence in deciding how soon this desirable state of things will come about.

It is hardly likely in these matter-of-fact days that this type of aerial smuggler will share with his forerunners the glamour with which the popular imagination of the eighteenth century surrounded the life of adventurers of this kind. In those days smuggling was so generally practised in Great Britain as to become a kind of national failing, and the smuggler was often regarded as a popular hero, like the *contrabandista* of modern Spain. He had a staunch apologist in Adam Smith, the great economist, who wrote of the smuggler as "a person who, though no doubt highly blamable for violating the laws of his country, is frequently incapable of violating those of natural justice, and would have been in every respect an excellent citizen had not the laws of his country made that a crime which nature never meant to be so."

Assuming that the land type of aeroplane would be used, the question of "inland coastguards" naturally presents itself. Before discussing them, however, we must eliminate so paradoxical a name, coin a new word, and call them "airguards."

Their sphere of usefulness would be far greater than the tracking of the possible private-owner-pilot-smuggler. When one considers the enormous number of fields throughout the British Isles in which an aeroplane can make a landing, the problem of providing sufficient airguards in every part of the kingdom assumes serious proportions. It is all the more important when it is realised that their duties must include such work as getting help in case of "crashes"; examining, for contraband, machines forced to descend through engine failure and other mechanical causes; watching for foreign or suspicious-looking machines and inspecting them should they land outside an aerodrome; communicating with police stations, fire brigade stations, hospitals, etc.

All these duties, as any flying man knows, would necessitate the covering of innumerable miles at high speed as well as much arduous foot-slogging over fields, with their hedges, ditches, and other obstacles. The nature of the airguards' work would call for the establishment throughout the country of a series of airguard stations each garrisoned by two or more airguards. It need hardly be said that each station would be provided with a telephone. Every airguard would be an expert motorcyclist, each having a machine for his sole use; without it he would be greatly handicapped, so it must be kept in perfect tune, ready for instant use. He would carry, on his person or cycle, a telescope or binoculars, a first-aid set, a few tools such as wire-cutters, hacksaw, etc. (for rescue work in the event of crashes), and an automatic pistol.

In addition to the airguards, whose number could be deter-

mined only by experience, the police throughout the country should receive special instruction in matters connected with flying. Any policeman on duty finding it necessary to communicate would ring up or go to the nearest airguard station, and thus be able to give a more intelligent and intelligible report than does our present day Robert—he is always willing to help us, but is quite untaught in matters aeronautical.

If the airguards were made part of the police force, they might sometimes work from police stations, but often (on Salisbury Plain, for example) it would be necessary to provide special airguard stations. In course of time it would probably be found best to make the airguards a separate service, like the coastguards. It would be essential to give them the power of arrest and the power of search without the presence of police or Customs. All private aerodromes and privately-owned aeroplanes would be open to inspection by airguards at any time. The public landing grounds of the future and those owned by the proprietors of commercial passenger-carrying and cargo machines would be suitably dealt with by the Customs authorities, by stationing representatives at these places as is done at docks and harbours. There should always be close co-operation between airguards, police and Customs whenever necessary or possible.

Special regulations would have to be made to cover the subject of inland flights, and the chief difficulties in the framing of these would be in the matter of the private owner. The latter could begin flights from private aerodromes as well as from commercial and public landing grounds. Obviously he would be liable to undergo search every time he made a landing, but to be obliged to submit to this or to obtain a special permit every time he wished to make an inland flight would be a very irksome rule. It would also result in greatly restricting the use of private flying machines, and thus do great harm to the industry, just as any possible progress in the motor car industry was practically stifled in the early days through the rigid enforcement of the ridiculous regulations governing the use of mechanically-propelled vehicles on public highways. The difficulty could be overcome by requiring every pilot to carry a licence which he would produce upon demand whenever he made a landing. Only when making a flight from England to a foreign country would he be obliged to obtain a special permit. Returns of all landings of machines entering this country from abroad, giving name of pilot, time, place, and number of machine, would be sent daily to a central authority. This authority would also receive from abroad similar daily lists of machines which had landed in foreign countries, flying from this country. It would be extremely difficult for a pilot unobserved to make a flight from England to France, for instance, land in a field other than one of the special landing grounds which would probably be nominated or incoming foreign machines, pick up contraband goods anywhere near, convey them to England and land in an unofficial field on this side. He would find it necessary to break so many regulations both here and in France that detection would be practically assured.

The various regulations in force already, combined with the organization and precautions suggested in this article, would be sufficient to deter a pilot from dropping overboard any contraband goods to accomplices below. To do so he would be obliged to limit himself to areas within which machines from abroad are required to land. While flying over these areas he would be under observation, and his action in dropping a parcel overboard could not easily pass unnoticed by airguards and police below.

Aerial smuggling by the users, both crew and passengers, of the commercial classes of aircraft have now to be considered, and it can easily be understood that, as in the case of a steamer, the crew and passengers travelling by the various machines enumerated above would have the power to attempt smuggling. Whether the results would prove satisfactory to themselves would, of course, depend upon their ingenuity and upon the efficiency of the Government organisation. Although crew and passengers present cases in many respects similar to one another, they are in others singularly at variance, and especially so in the matter of motive. There is little doubt that an employé, if paid on the very moderate scale of that deserving class the mercantile marine, would, if he were to attempt to smuggle, do so with the idea of gaining some pecuniary advantage. The aerial passenger, too, would often have this as his sole object, but there is also that not inconsiderable class of passenger, possibly imbued with a natural love of adventure and the taking of risks, who would always endeavour to smuggle contraband goods concealed about the person or in baggage, with no other object than a secret delight in "besting" the authorities. We all know the dear old lady whose religious convictions, elastic-sided boots, pet dog, and general air of dull and pious respectability seem to point to her as being the very last person who would attempt to evade His Majesty's Customs laws. Yet she is often filled with a consuming passion to pass some small contraband article through the Customs undetected for the pure joy of doing so, afterwards unblushingly boasting of her prowess among her friends.

The prevention and detection of aerial smuggling by crew and passengers would not in practice present so many difficulties as that by those who travel by the sea. Owing to the comparatively small loads which even very large aeroplanes would be capable of carrying, the weight of luggage allowed to each passenger would be restricted. Whether search were to take place at embarkation or upon landing, detection would thus be correspondingly easier. So far as can be seen, no few features would be likely to exist, as the Customs authorities would have their representatives upon every public and commercial landing ground, and the searching of luggage and cargo would be made much in the same way as on the quays at present.

Special legislation of an international character would doubtless be created to deal with foreign aircraft entering the British Isles. For example, marks easily distinguishable by observation from the ground such as the Union Jack for British machines, the Tricolour for French, and so on, could be clearly exhibited by being painted on the lower surfaces of the main planes as well as a number plainly marked in large figures under the *fuselage*. Already there exist orders issued before the War by the Home Secretary, acting under powers conferred by the Aerial Navigation Acts of 1911 and 1913, whereby flying, except by our own Service machines, is prohibited over the areas named in these orders. Certain portions of the coast line are also forbidden to machines from abroad, and the areas within which they are permitted to land are clearly laid down. Governments would keep each other advised of any changes that it might be found necessary to make in limitations of this nature, and the information would be accessible to users of aircraft. A regulation would also seem desirable compelling all machines, British and foreign, coming into the British Isles, to cross the coast below a certain limit of height. This would entail no risk or hardship, for although a pilot would often wish to fly at a greater altitude when passing over the sea he could easily glide down when approaching the coast. Any machine disregarding these rules could be followed by means of a series of telephone messages transmitted through the airguard stations. Upon landing, the nearest airguard should be on the spot and in possession of powers to deal with the offender.

It has been suggested that when flying comes into general use it will be necessary to police the skies. This, however, seems to be quite an unnecessary measure, at any rate so far as smuggling is concerned. It is true that an ascent by aeroplane might be necessary if a pilot were to persist in flying at a very high altitude after entering the country, but if it were his intention to smuggle he must come down sooner or later, and the airguards would meet him upon landing. If, on the other hand, observation by telescope showed it to be a foreign machine, or if it were behaving in a suspicious manner, especially when over a prohibited area, this would be a matte for the Royal Air Force to take in hand, and a pilot would be sent up to deal with the intruder in a suitable way. Machines flying from overseas and crossing our coasts out of sight above the clouds must sooner or later make their presence known by coming down through the clouds. They could have no possible object in staying above them nor gain any advantage in doing so. Except in war-time they would be quite harmless while they remained there, whatever their purpose may have been in flying to this country. A constant air patrol by police above the clouds would hardly be seriously suggested, in view of the enormous expense it would entail.

The foregoing notes apply mainly to flying by day, but there is little doubt that the smuggler's best opportunities would be at night; for clearness it has been necessary to work up to this very important side of the question by first considering day flying. It is assumed that aircraft will be allowed to enter this country by night as well as by day. Commercial machines will not present any greater difficulties than do ships entering harbours at night. They will be required to show lights in various positions and of various colours in order to indicate the nature of the craft, and they will be treated in the usual way upon reaching their landing grounds. But it may also be assumed that a privately-owned machine, if bent upon smuggling, would not hesitate to show similar lights rather than arouse suspicion by crossing the coast without lights. The latter omission would put the airguards on the alert, and the presence of the craft over the country

would be telegraphed (by wire or wireless) or telephoned all over the kingdom. Again, on a night when there was a layer of high clouds, a machine might climb up through the clouds long before reaching these shores, cross the coast unnoticed by those below, and continue its journey out of sight. The engine would be shut off above the clouds, and the machine would glide silently down with lights extinguished, unheard and unseen. The question of the landing would then be the factor upon which would turn the possibility of detecting the machine. To land it in bright moonlight would be risky, even to a skilled pilot. To land it on a cloudy, dark night, would be a feat attended with great danger, as every pilot knows, and one which few would voluntarily undertake. It would thus be necessary to land by means of a searchlight from the machine, parachute flares dropped down, or by lights or flares shown on the ground by an accomplice. The period for which any of these lights must be shown would render the manœuvre visible to the airguards below.

It is probable, however, than no elaborate methods of this kind would be attempted, for perhaps the best and safest method, from the smuggler's point of view, of "delivering the goods" by night would also be the simplest, namely, by a straightaway flight from, say, France to any aerodrome in the British Isles in a permitted area, flying fairly low, observing all lighting and other regulations; then throwing overboard on the way a carefully packed parcel containing contraband goods. The latter would have be dropped within a few miles of the aerodrome into a pre-arranged field in which an accomplice would be waiting. He would, if necessary, indicate his position on the ground by means of a flash-lamp or other signal exhibited with great care.

There are several suggestions that might be put forward to deal with night smuggling. One method would be organised search in areas in which it was suspected that contraband goods had been dropped. This would provide no remedy at all where smuggling had taken place unsuspected, and, even if suspected, the area to be searched would often be so great as to make a thorough search impracticable.

Another method would be the adoption of similar means to the *octroi* system of France. The country would be divided up into districts, over the boundaries of which the passage of goods which had previously been smuggled into the district by air would be detected by suitable examination. Such a system, however, besides being a very expensive one in the matter of the provision of thousands of additional Customs officials all over the country, would do so much to interfere with legitimate internal commerce that it would be found unworkable.

Another means, simple but drastic, would be international prohibition of night flying by privately-owned machines. It would then be almost impossible for a pilot to begin a flight at night, continue over land and water with a noisy engine and land again in this or in his own country again without being detected. There is thus little doubt that aerial smuggling could be entirely prevented in this way. Any pilot starting out late in the day and flying on until darkness overtook him would have to give an entirely satisfactory account of his action to the authorities. But when flying in peace time really becomes a part of our daily life, like "taking the train," the making of an international law of this nature would be practically impossible. In fact, all the difficulties of dealing with aerial smuggling could be just as easily settled by the introduction of universal free trade!

Probably the most workable system would be for the pilot of a privately-owned machine to be obliged to apply for a permit for each proposed flight to be carried out partly or wholly by night. He would be required to state his route and his intended landing place. His machine would be examined for contraband before setting out. On his permanent licence an entry, with date and hour, would be made, to indicate that he was the holder of such a permit. If a pilot were to start his flight late in the day and make a day landing *en route*, the production of his licence upon landing would reveal this entry, and the airguard would keep the machine under observation until it had resumed its journey.

To take once more the example of attempted smuggling from France to this country, but this time under the night-flying permit system, the machine might succeed in setting out at night from a private aerodrome in France without hindrance. We are assuming that the pilot had purposely omitted to obtain a permit. We will even suppose the machine could leave without the airguards or police knowing from what aerodrome it started. This is unlikely, however, for the noise of its engine when commencing the flight would attract their attention to its neighbourhood. It would then fly over to England and drop its load. But, if undetected up to this point, the chances would be much against its landing on this side or returning and landing in France unseen, and the pilot would find it difficult to explain away his illegal flight under such suspicious circumstances. Other ways of evading the regulations would doubtless be attempted, but it would be the business of the airguard service to find suitable counter measures.

In conclusion, it should be borne in mind that the organisation here suggested is not intended to be taken as complete in every particular, nor would it be created all at once. To name only one point, it is probable that wireless would play a much greater part in it than has been indicated. The rapidity of the development of the airguard system would depend upon the progress made in the general use of aircraft. At the same time it cannot be overlooked that this progress may be greatly accelerated by inventions of which we have no conception at present. Except for such unforeseen developments, however, the trend of aeronautical progress seems already to have shown itself and the continuance of its present tendencies may necessitate, sooner or later, such safeguards as are here outlined.

"The All-Steel Aeroplane"

THE lecture arranged by the Royal Aeronautical Society to be delivered by Capt. A. P. Thurston, D.Sc., R.A.F., on Wednesday last, had to be postponed, as Capt. Thurston is unfortunately suffering from a severe attack of influenza.

Folkestone–Cologne Mail Service

THE aerial service between Boulogne and Cologne has now been linked up with Hawkinge aerodrome near Folkestone. The initial flight during the week-end proved successful, and only the very worst weather will prevent pilots of the 120th squadron from maintaining the service between Hawkinge and Maison Selle in the north of France. Twenty-three bags were taken across on the first journey, three machines carrying six bags and another taking five. The four aeroplanes, of the D.H. 9 type, flew in formation, starting at 9 a.m., their cargo being securely fastened in the portion usually set aside for the observer. They made a splendid crossing, and after a short stay at the delivery station they returned, reaching Hawkinge just before 3 in the afternoon. They did not bring any mails back with them, and it is not anticipated they will do so for some time. The result of the aerial service will be that the mails will reach Cologne within 10 hours of their despatch from London.

From Paris to South America

AMONG ambitious flights which are to be attempted by Frenchmen is one by Lieut. Fontan, who is said to have been authorised to fly from Paris *via* Casablanca to Dakar in Senegambia, and thence across the Atlantic to Pernambuco. He is to pilot a 500 h.p. two-motor aeroplane, which will carry 2,400 litres of petrol. He will carry with him a mechanic. At Dakar he proposes to change motors and then attempt a solo flight, at the first favourable opportunity, from Dakar to Pernambuco, passing from Dakar to Cape Verde, some 500 miles, thence to San Paulo, a distance of 1,600 miles, thence to Fernando, some 380 miles, and thence to Pernambuco, another 340 miles.

Capt. Coli and Lieut. Roget also propose to make a similar flight.

More W.R.A.F.s Wanted

THE Ministry of Labour announces that there are vacancies in the clerical, domestic and motor transport sections of the Women's Royal Air Force. In the Motor Transport section only thoroughly experienced applicants will be considered. Applications for employment in these categories will be received through the Employment Exchanges, where full particulars of the vacancies concerned and of the terms and conditions of service are available.

To Football Match by Aeroplane

FOLLOWING the example of one of the Service baseball teams in the United States, which proceeded to its match by aeroplane a few weeks ago, a French football team proposes to fly on Saturday from Paris to Brussels, where they are due to play the first match with the Belgians on Sunday. They will travel in a four-engined Voisin machine, and four other aeroplanes will convey the officials and others.

FLIGHT & AIRCRAFT ENGINEER

MARCH 6, 1919

SOME POINTS IN AEROPLANE DESIGN

BY F. S. BARNWELL, CAPTAIN, R.A.F.

(*Continned from page* 280)

Plate VII.—I attempt now, from model data, a simple investigation into comparative size of tail plane required to give longitudinal stability to a monoplane, a "square" biplane and a "staggered" biplane. The aerofoil form is the same throughout. On the figures are shown the five different fore and aft positions, and the constant vertical position, of centre of gravity of whole aeroplane considered for each type.

The curves below each type give for it values of pitching moment on a base of angle of incidence, for each of the five different positions of centre of gravity.

The pitching moment at any one attitude is the product of the "absolute" coefficient of total reaction on the aerofoil (or aerofoils), multiplied by the vertical distance (expressed as a fraction of chord length) of the line of this reaction from the centre of gravity of the whole aeroplane. The curves indicate diving moment when above the heavy horizontal zero line, and stalling moment when below this line.

The small figures in circles attached to each curve give the fore and aft position of centre of gravity for which the particular curve is drawn.

It is interesting to note how the range of pitching moment decreases as the centre of gravity is moved forwards, also that it is, on the whole, less for the "square" biplane than for the monoplane, and less for the "staggered" than for the "square" biplane.

These figures are all obtained directly from experiments made by the N.P.L. on model aerofoils of 18 in. span by 3 in. chord at 40 ft. per sec.; no attempt has been made to correct for "full size" conditions. The correction required would be almost entirely due to increased lift coefficient values (especially at small angles of incidence), for "full size" conditions; the values for centre of pressure position would be practically unaltered. As model figures are also used when considering the tail required for stability, the increase in lift coefficient value due to change from model to "full size" conditions may, I think, be considered to alter by about the same amount for both aerofoils and tail; that is to say, the same proportions of tail should produce about the same results for both model and full-size machines.

Plate VIII.—On this plate are given the three different forms of tail plane which are investigated. Case I is a "symmetrical section" tail, Case II a "wing form" tail with its convexity downwards, Case III the same "wing form" tail but with its convexity upwards. In the present state of aeronautical nomenclature, Case I would be miscalled a "non-lifting" tail; Case II a "depressing" tail (I suppose); Case III a "lifting" tail, and all three terms would be erroneous.

You will note that I have assumed a constant position for centre of reaction on the tail, which is accurate enough for our purpose, as the tail chord is small compared to distance of tail from centre of gravity. I have taken that the distance of this assumed fixed centre of reaction on the tail is a distance from centre of gravity of aeroplane of amount equal to two and one-half times the chord length of the aerofoil, or aerofoils. I have also, for simplicity in calculating the tail moment, assumed that the chord of the tail when produced passes through the centre of gravity of the aeroplane.

Figures for all three tails are taken directly from N.P.L. figures for models of 18 in. span by 3 in. chord at 40 ft. per sec., and both the "wing form" tails are of the same form as the main aerofoils. I have next proceeded to find the smallest size for each of these three forms of tail, which would make each of these three aeroplanes just stable, for each of its five positions of centre of gravity, *assuming the tail to be in undisturbed air*.

The method used in doing this is as follows:—On tracing cloth I drew out a series of curves of "tail moment" on a base of angle of incidence of tail. As the chord of the tail points at the centre of gravity, it was necessary only to consider the normal force on it. The "tail moment," therefore, for any particular angle of incidence for the tail, is the product of the "absolute" normal force coefficient for this incidence multiplied by $2.5 \times a$. a, the area value of tail, is taken as a fraction of the main aerofoil (or aerofoils) area. Of course, the same scales were used in drawing these tail moment curves as were used for the pitching moment curves.

For each tail, then, were run a series of curves with values for a, varying from .2 to .5.

I assumed that the aeroplane is to trim at + 2° incidence for main aerofoils. So a tail moment family of curves was slid in turn over each of the pitching moment curves, and thence, by interpolation if necessary, was found the particular tail curve which, when intersecting the pitching moment curve at + 2°, would just lie altogether *above* the pitching moment curve to left-hand side of intersection and altogether *below* piching moment curve to right-hand side of intersection.

Reverting again to Plate VII, I have not shown the series of tail moment curves employed, but on the monoplane pitching moment diagram are shown a few selected curves of tail moment. Intersecting the .30 centre of gravity pitching moment curve at + 2° is shown, in dotted line, the moment for a symmetrical tail of area = .025 main aerofoil area. This curve cuts the base line at + 8.9°. Therefore we see that with this tail set at — 8.9° to the aerofoil chord the aeroplane will just be stable; you will note that there is a neutral spot at + 6.5°. Also intersecting the .30 centre of gravity pitching moment curve at + 2° is shown, in dot and dash line, the moment for a "wing form" tail "convex-down" of area = .025 main aerofoil area. This curve also cuts the base line at about + 8.9°. Therefore we see that with the chord of this tail at — 6.5° (its zero lift is at + 2.4°) to the aerofoil chord the aeroplane will just be stable; you will note that again there is a neutral spot at + 6.5°, and that with this "convex-down" tail the stabilising moment is greater for nose diving and less for stalling than it is with the symmetrical tail of same area.

On the .36 centre of gravity pitching moment curve is drawn, in dotted line, the moment curve for a symmetrical tail of area = .038 main aerofoil area, set at — 3.2° to chord of main aerofoil. This gives stability with a neutral point at + 14°.

On the .42 centre of gravity pitching moment curve is drawn, in dotted line, the moment curve for a symmetrical tail of area = .064 main aerofoil area, set at — 1.4° to chord of main aerofoil. This gives stability with a neutral spot at about + 13½°. Also on the .42 centre of gravity pitching moment curve is drawn, in dot and dash line, the moment curve for a "convex-up" tail of .064 main aerofoil area, set at — 3.5° (its zero lift is at —2.4°) to main aerofoil chord. This gives stability with a neutral spot at — 4.5°. You will note that with the "convex-up" tail the stabilising moment is greater for stalling and smaller for nose-diving than with the symmetrical tail. We cannot give more time to consideration of the method employed, and I hope this brief explanation is sufficient.

Returning again to Plate VIII, we have then values for size of tail plane required, and required setting for chord of tail relatively to chord of main aerofoil, considering the tail as in undisturbed air. These values are given in the curves at the bottom of Plate VIII.

We must proceed to the consideration of what will be the added drag due to tail.

I have made a very rough assumption as a start, namely, that due to the downwash from the main aerofoils we must employ a tail of twice the area found necessary in undisturbed air. As a matter of fact, this is pretty nearly correct, and at any rate is quite a fair assumption for a comparative investigation, which is what this is intended for. I have taken the "absolute" drag coefficients for tail from the curves at the top of Fig. 8. For any one case, then, the tail drag is taken as area of tail (expressed as a fraction of main aerofoil area) multiplied by "absolute" drag coefficient proper to tail, and divided by "absolute" drag coefficient proper to main aerofoil. This gives us a value for tail drag expressed as a fraction of the main aerofoil drag.

But this is not the total drag due to tail, for if the tail has to exert a downward force for stabilising, the wings must exert a lift, over and above total weight of aeroplane, of amount equal to down load on tail, and this added lift must be paid for by added drag. Similarly if the tail has to exert an upward force for stabilising, the lift of the wings will be less than the total weight of the aeroplane by an amount equal to lift of tail, and this decrease of wing lift gives decrease of drag. The amount of the necessary addition to, or subtraction from, lift of wings, for any one condition, is given by—value for pitching moment divided by tail lever; so it is worthy of note that a long-tailed machine will, at high speeds at any rate, have a smaller increment of wing drag due to tail down load, than will a short-tailed machine.

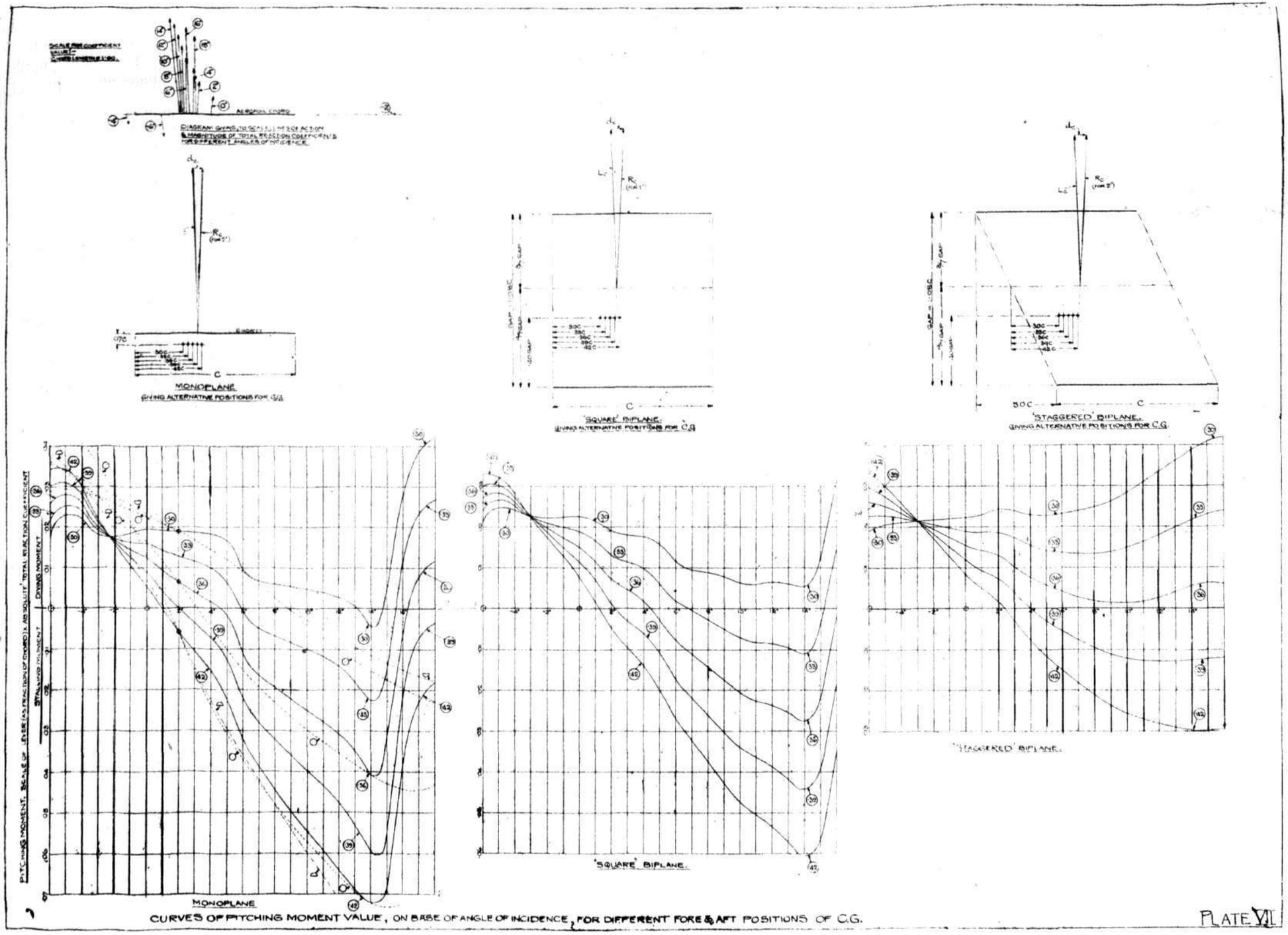
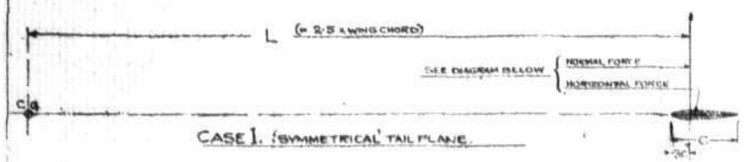
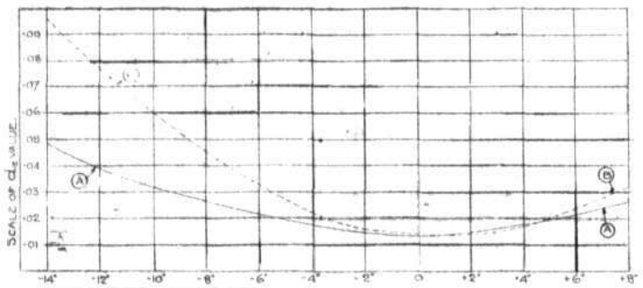


PLATE VII.—Some points in aeroplane design





CURVES OF 'ABSOLUTE' DRAG COEFFICIENT, C_{D_T}, ON A BASE OF ANGLE OF INCIDENCE

FOR:- (A) 'SYMMETRICAL' TAIL PLANE.
(B) 'WING-FORM' TAIL PLANE.

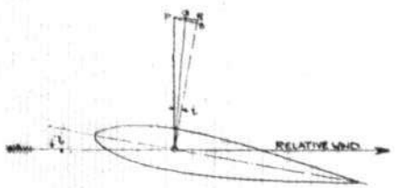
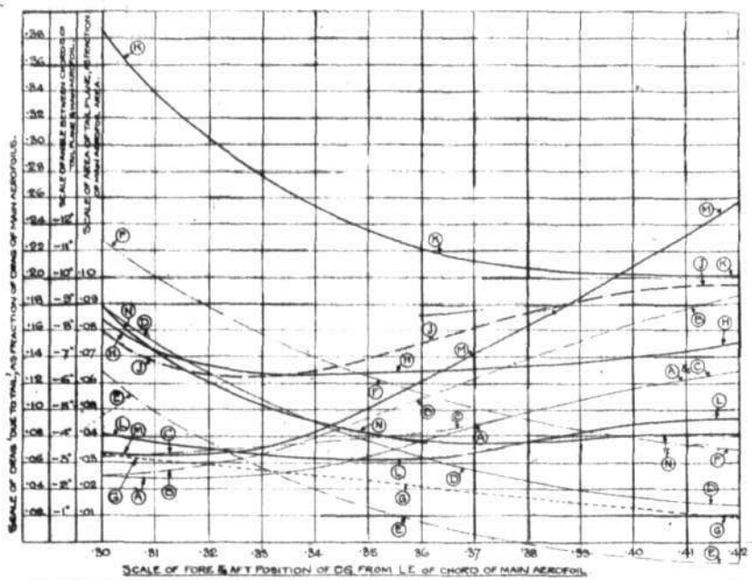
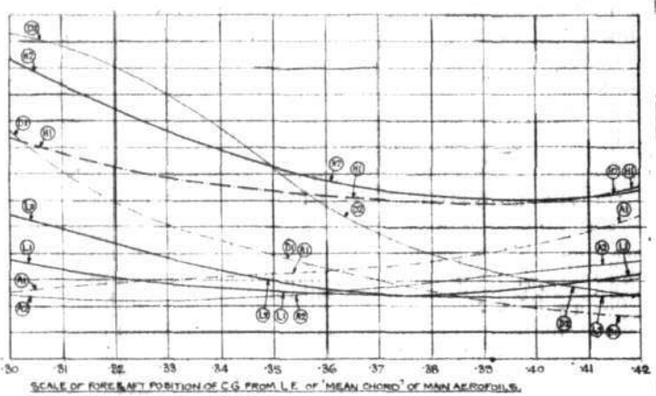


DIAGRAM OF WIND FORCES ON TAIL PLANE

OP = LIFT COEFFICIENT
RQ = DRAG COEFFICIENT
OR = 'NORMAL FORCE' COEFFICIENT = (OP cos i + RQ sin i)
RQ = 'HORIZONTAL FORCE' COEFFICIENT = (RQ cos i − OP sin i)
(NEGATIVE IF TOWARDS NOSE)





CURVES FOR MONOPLANE :-

- (A) MINIMUM AREA OF TAIL NECESSARY FOR STABILITY, 'SYMMETRICAL' FORM.
- (B) " " " " " 'WING-FORM' CONVEX DOWN.
- (C) " " " " " " UP.
- (D) ANGULAR SETTING OF CHORD OF TAIL PLANE TO CHORD OF AEROFOIL, 'SYMMETRICAL' TAIL.
- (E) " " " " " " 'WING-FORM' CONVEX DOWN.
- (F) " " " " " " UP.
- (G) ADDITIONAL DRAG OF AEROFOIL, DUE TO STABILISING DOWN LOAD ON TAIL, AS FRACTION OF ORIGINAL AEROFOIL DRAG.
- (H) TOTAL DRAG DUE TO TAIL PLANE (= (G) + DRAG OF TAIL PLANE), AS FRACTION OF ORIGINAL AEROFOIL DRAG, FOR 'SYMMETRICAL' TAIL.
- (J) " " " " " " " " " " " " " " " " " " 'WING-FORM' TAIL CONVEX DOWN.
- (K) " " " " " " " " " " " " " " " " " " UP.
- (L) AS (H) BUT WITH MAIN AEROFOILS AT +4° INCIDENCE.
- (M) " (G)
- (N) " (B)

NOTE:- CURVES (A) (B) (C) (D) (E) (F) (G) (H) (J) (K) ARE FOR ALL VALUES OF ANGLE OF INCIDENCE OF MAIN AEROFOILS.
" (A) (B) (C) (D) (E) (H) (J) (K) (L) (M) (N) ARE VALUES WHEN ANGLE OF INCIDENCE OF MAIN AEROFOILS IS 0° (I.E. HIGH SPEED CONDITION).
" (A) (B) (C) (D) (E) (L) " " " " " " " " " " " " " " " " " " +4° (" CLIMBING ").

CURVES FOR BIPLANES :-

- (A1) AS (A) FOR MONOPLANE, BUT FOR 'SQUARE' BIPLANE.
- (A2) " " " " " " STAGGERED " .
- (B1) " (B) " " " " SQUARE " .
- (B2) " " " " " " STAGGERED " .
- (F1) " (F) " " " " SQUARE " .
- (F2) " " " " " " STAGGERED " .
- (C1) " (C) " " " " SQUARE " .
- (C2) " " " " " " STAGGERED " .

PLATE VIII.—Some points in aeroplane design

We arrive then at results for total drag "due to tail," being sum of tail drag plus increment of wing drag due to tail down load.

Curves H. J and K give respectively total drag due to necessary "symmetrical," "convex-down" and "convex-up" tails for a monoplane, when the incidence of main aerofoil is o degrees, that is to say at high speed. Curves L, M and N give respectively total drags due to same tails, when incidence of main aerofoil is +4 degrees, that is to say at approximately climbing, or cruising, condition.

Curve H_1 is total drag "due to tail" for "square" biplane with incidence of main planes o degrees, curve H_2 is ditto for "staggered" biplane. Curve L_1 is total "drag due to tail" for "square" biplane with incidence of main wings +4 degrees, and curve L_2 is ditto for "staggered" biplane.

According to these curves we find that for a monoplane the best condition for high speed is to have the C.G. at about .325 and to use a "convex down" tail, whilst the best condition for climb is to have the C.G. at about .35 and to use a symmetrical tail. Probably the best all-round condition would be to have C.G. at about .34 and use a symmetrical tail; this tail would, according to curve "A," need to be .028 × 2, or .056 of the area of the main aerofoil, and, according to curve "D," would need to be set at virtually −4.6 degrees to main aerofoil, meaning about −2 degrees actually, to allow for down-wash. For the two biplanes are drawn curves for "symmetrical" type of tail only, as it appears to be at least as good as either of the other two types for the monoplane.

For the "square" biplane the best condition for high speed is to have the C.G. at about .385, and for climb to have the C.G. at about .37. For the "staggered" biplane the best condition for high speed is to have the C.G. at about .40, and for climb at about the same position.

It is important to bear in mind that the fore and aft positions of centre of gravity, which I have quoted, refer to the figures on Plate VII. It is obvious that if we raised or lowered the C.G. the results would be altered. Up in the top left-hand corner are drawn, for the monoplane only, lines representing in direction and magnitude the total reaction at angles of incidence varying from −6 degrees to +18 degrees. The general trend of these lines is to converge when produced downwards, meaning that the lower the C.G. the better the stability considered "statically," if one may so express it. But in practice a low C.G. means probably a high moment of inertia, and this in excess gives slowness on control and dangerous pitching. It should also be noted that the quoted fore and aft position of C.G. for the "staggered" biplane is measured from the fore end of an arbitrarily assumed "mean chord."

One other point should be noted—namely, that I have omitted the question of weight of tail; obviously the larger the tail the heavier, and the weight of the tail has to be paid in wing drag. It would be a very small factor, perhaps almost negligible, but it means that one should incline to a slightly farther forward position of C.G., and, therefore, a slightly smaller tail than is indicated as best condition by these curves.

Finally all these tails are of 6 to 1 aspect ratio, so if in practice a smaller aspect ratio be employed, then must a somewhat larger area be used to offset the decreased value of lift coefficient.

(To be concluded)

◈ ◈ ◈ ◈

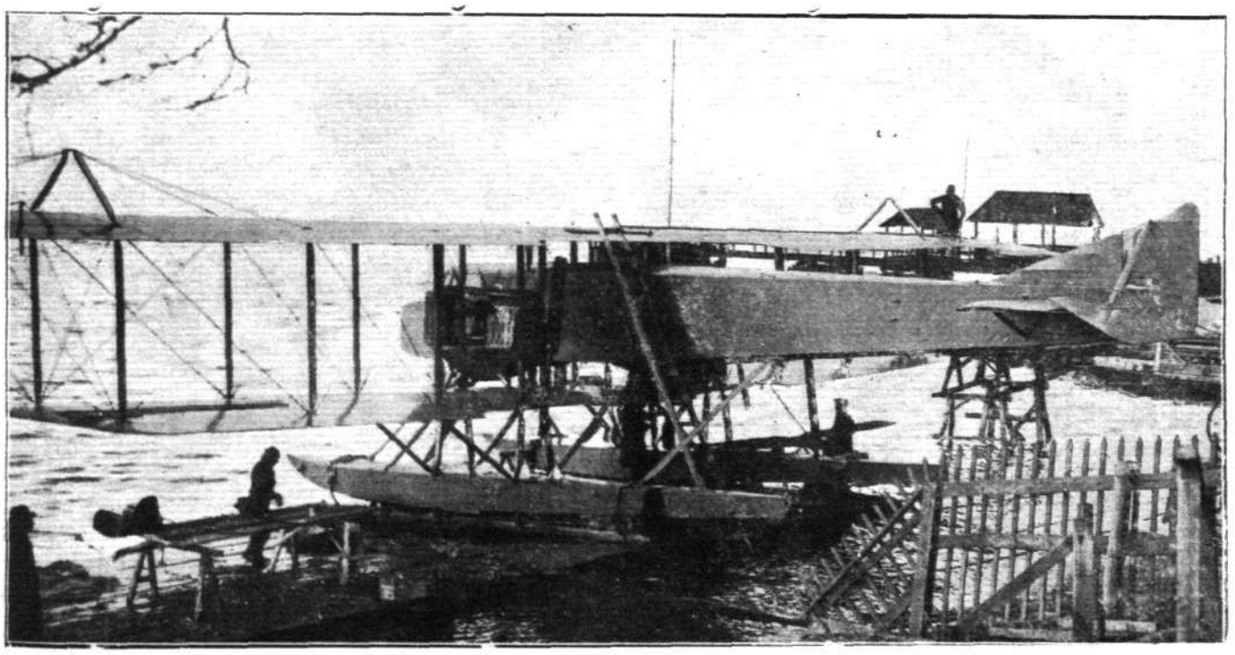
The London to Madrid Flight

GREAT interest is being aroused in Spain by the proposed flight of a couple of De H. 4's, a Bristol Fighter and a four-engined Handley-Page from England. The smaller machines, after their flight from Biarritz will be exhibited on the acecourse at San Sebastian, but the Handley-Page will probably go on to Madrid, *via* Victoria and Burgos. It will land at the military aerodrome of the Four Winds, just outside the Spanis hcapital.

A Paris–Brussels Service

THE Belgian Foreign Minister announced on February 26, says *The Times* Paris correspondent, that his Government will permit henceforth an aerobus service to run between Belgium and France. A provisional organisation is already formed. Ten aeroplanes, each capable of carrying 12 passengers with luggage, a pilot, and mechanics, 16 persons in all, will be ready in March. They will be well fitted up, going so far as to possess a small library and a bar!

The price of a journey between Paris and Brussels—which includes a life insurance for £4,000—is to be 300 francs (£12), that is to say, a franc a kilometre. A French society will later take over this organisation, which is expected to run a service between Amsterdam, Antwerp, Lille and Paris and thence to Bordeaux and Nice.



Captain Sundstedt's seaplane as seen from behind, upon which he contemplates making a try for the Trans-Atlantic £10,000 flight prize of the *Daily Mail*. The wings of the 'plane measure 100 ft. It is equipped with two 400 h.p. Liberty motors, and is capable of a speed of 80 miles an hour. The cabin, which is completely enclosed, will hold four passengers. The two tons of petrol needed for the flight will be carried in the tank in the huge tail of the machine. The 'plane, without its passengers or fuel, weighs 10,000 lbs. Captain Sundstedt will fly from Bayonne (N.J.) to St. John's, Newfoundland, and from there attempt the flight across the Atlantic. He hopes to make the journey in 22 hours. The distance between Newfoundland and Ireland is about 1,800 miles.

AIRISMS FROM THE FOUR WINDS

A happy idea to have a Handley-Page passenger carrying 'bus—or anyway that part of it that matters to the passengers, viz., the cabin and *fuselage*—on view at Selfridge's in Oxford Street. Close inspection of this machine will do more with the individual public to create a popular atmosphere than miles of ordinary newspaper lineage. But why, oh why, have a bevy of beauties all got up in leather rig-outs, ear-flaps and all, seated on show in the luxurious arm chairs in the enclosed cabin? Surely it is not suggested that having to array oneself in that sort of garb for every trip will help the movement. The manequins, upon the occasion of the inaugural opening, looked anything but well placed under the circumstances, although for use at the pilot's side or for any semi-exposed position most of the "costumes" were well designed and looked quite fascinating—on the particular wearers. We hardly think though, under the present very ingenious provision for comfortable travel through the air, it need be rubbed in that nothing short of being thus encased in leather armour rig-out will suffice.

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Generous terms for aerial insurance are now under serious consideration at Lloyd's and already a good deal of practical headway has been made. It is not possible, however, as some seem to think, to quote a flat rate for anything aerial at present. The whole business is a complicated actuarial problem and only by stating each individual proposal is it possible to give even an approximate percentage premium. Many of the figures so freely published are purely fantastic. This, no doubt, will in time straighten itself out, but in the meantime it would be well for all those concerned, either as owners, constructors, passengers or pilots to cover themselves against all risks—not forgetting goods and chattels when transit is via the air. Any assistance we can give to prospective insurers is at their disposal, and we shall be pleased to put enquirers into the right channel to arrive at results.

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The Air Ministry *is* moving to Kingsway from the Hotel Cecil and Covent Garden Hotel.

Quaint sort of business keeping cats for raising alarms at the approach of enemy aircraft. Wonder whether the methods of giving warning by these expert detectors is upon the lines of a feline seance with which we were regaled the other night through, in an otherwise quite respectable suburb. If so, it should be made legal to do in any dealer or trainer who encourages such music, even for the alleged advantage of being able to detect the approach of enemy aircraft—at least until the next war comes along. By that time, if aircraft goes on developing at the rate it promises at present, most of us will be living underground and *our* detector-cat will be chained up at the front-outlet, with "Vocalian" adjustable baffles down our cave dwelling throttle.

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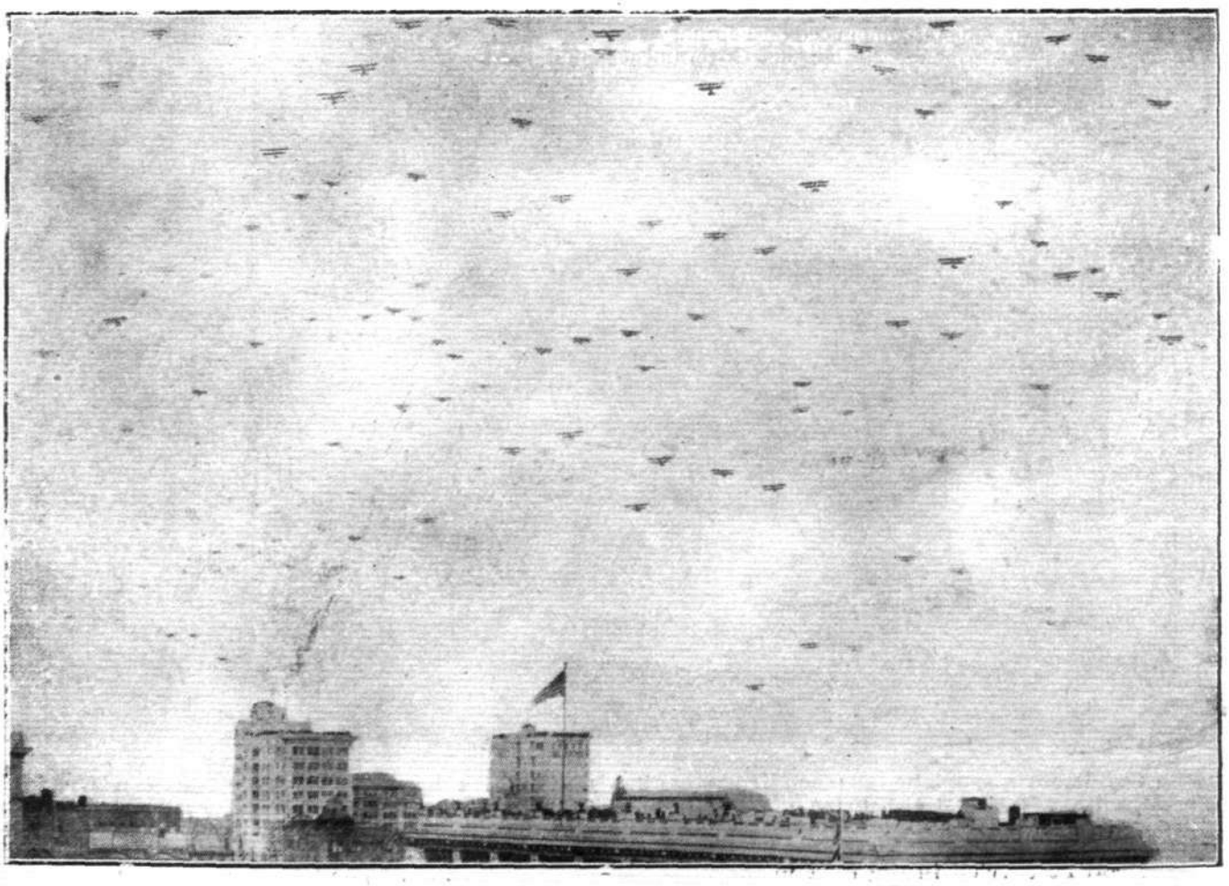
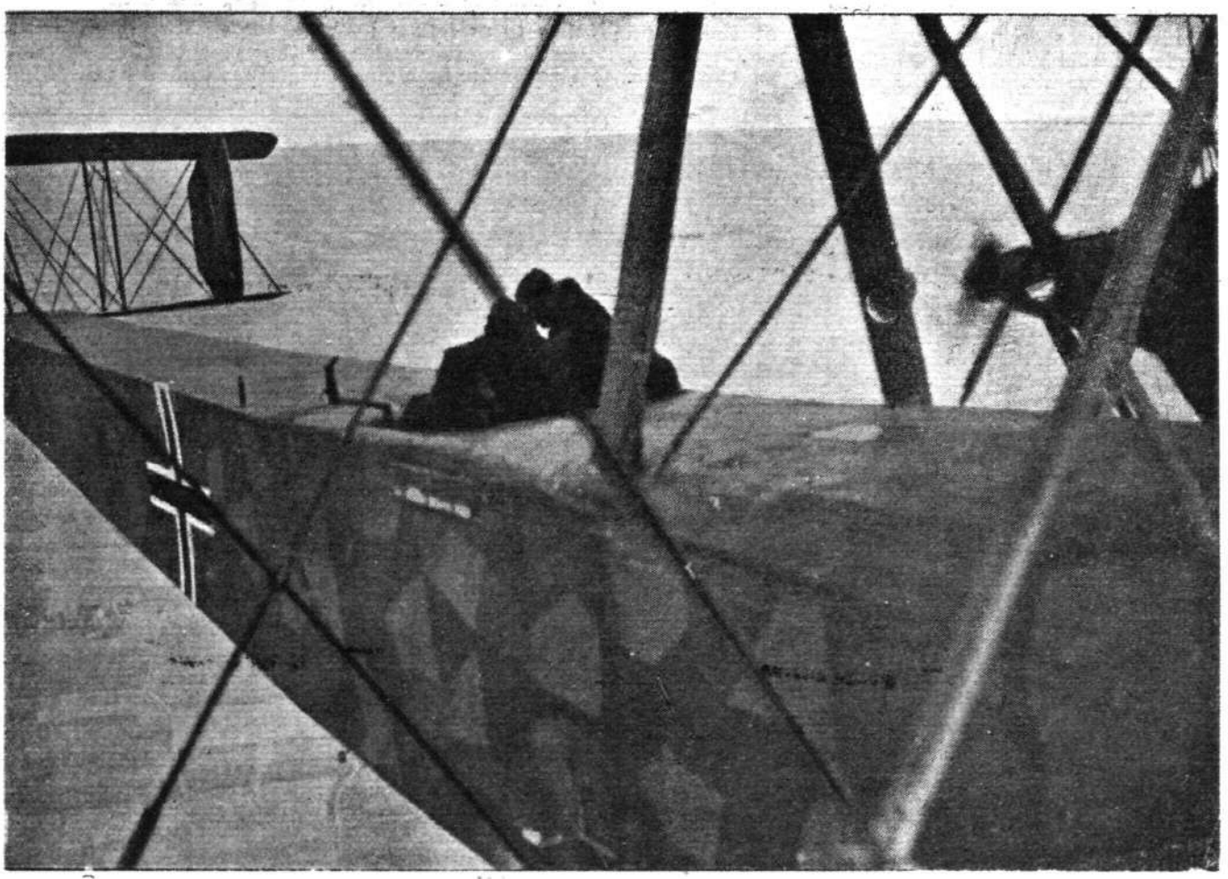
Many have been the tales told of succouring isolated outposts and people by means of aeroplanes during the War. A striking instance is now given in detail by the French Government in a special report dealing with the feeding of the civilian refugees at Le Cateau by the Royal Air Force authorities, the first official recognition of this remarkable feat. It appears that during the final phase of the Allied offensive the Germans had retired to the eastern side of Le Cateau, while British troops were aligned on the other side. The civilians had not been evacuated, and when they attempted to escape the Germans turned their machine-guns on them. The plight of these poor people was pitiful, for, in addition to being exposed to fire, they had no food whatever. This was known to both the Germans and ourselves. The Germans, of course, would not help them, and it appeared as if we could not.

Once again, however, the R.A.F. came to the rescue. No. 35 squadron was working on that sector, with Armstrong Whitworth machines. A supply of food was collected and dumped at this aerodrome, and the machines began to transfer it to Le Cateau—flying over low, in spite of furious fire from the Huns, and dropping it in streets until the town was sufficiently provisioned for the time being. It was typical

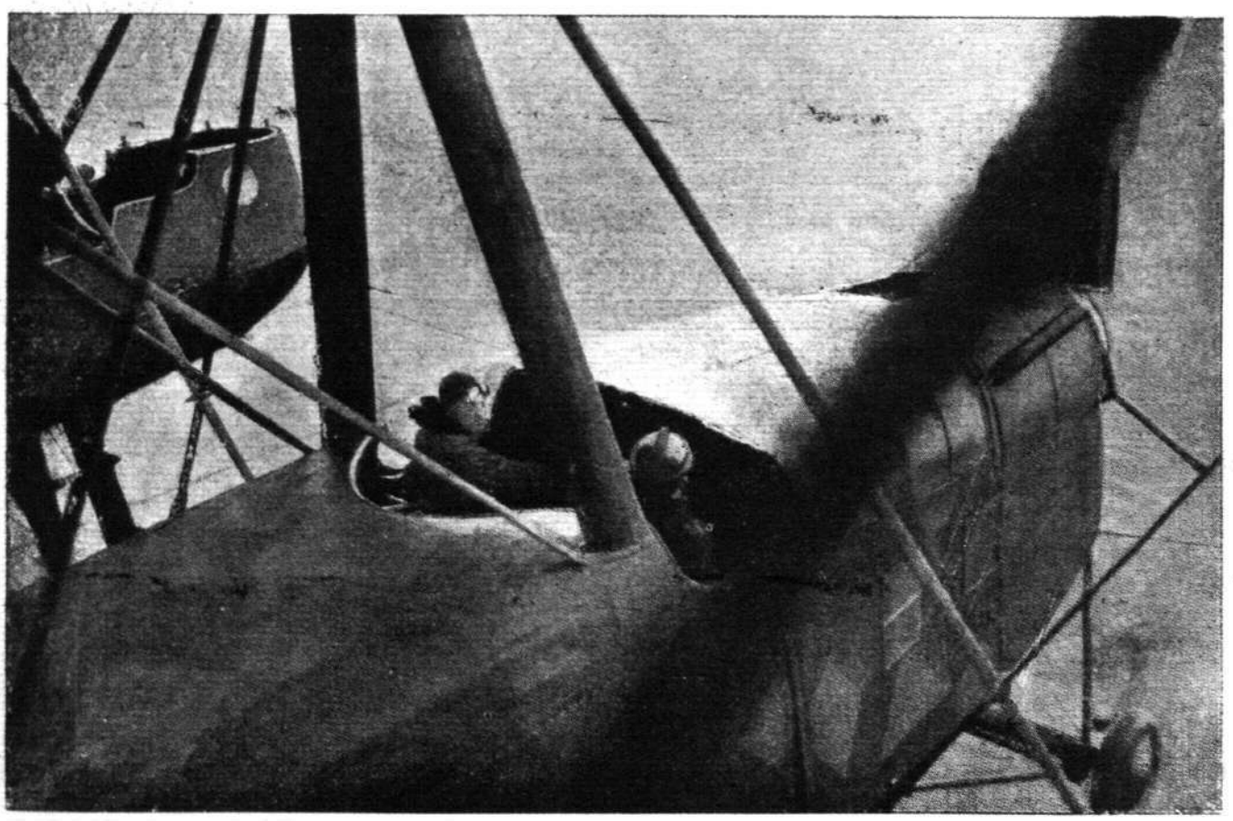


A SKY FULL OF AEROPLANES—VOICE CONTROL FORMATION.—On November 27, 1918, 202 aeroplanes from Rockwell, Ream and East Fields flew over San Diego in eight formations, led and directed by V.C. receiving and transmitting ships. (From the official publication of the United States Air Service Clubs Association.)



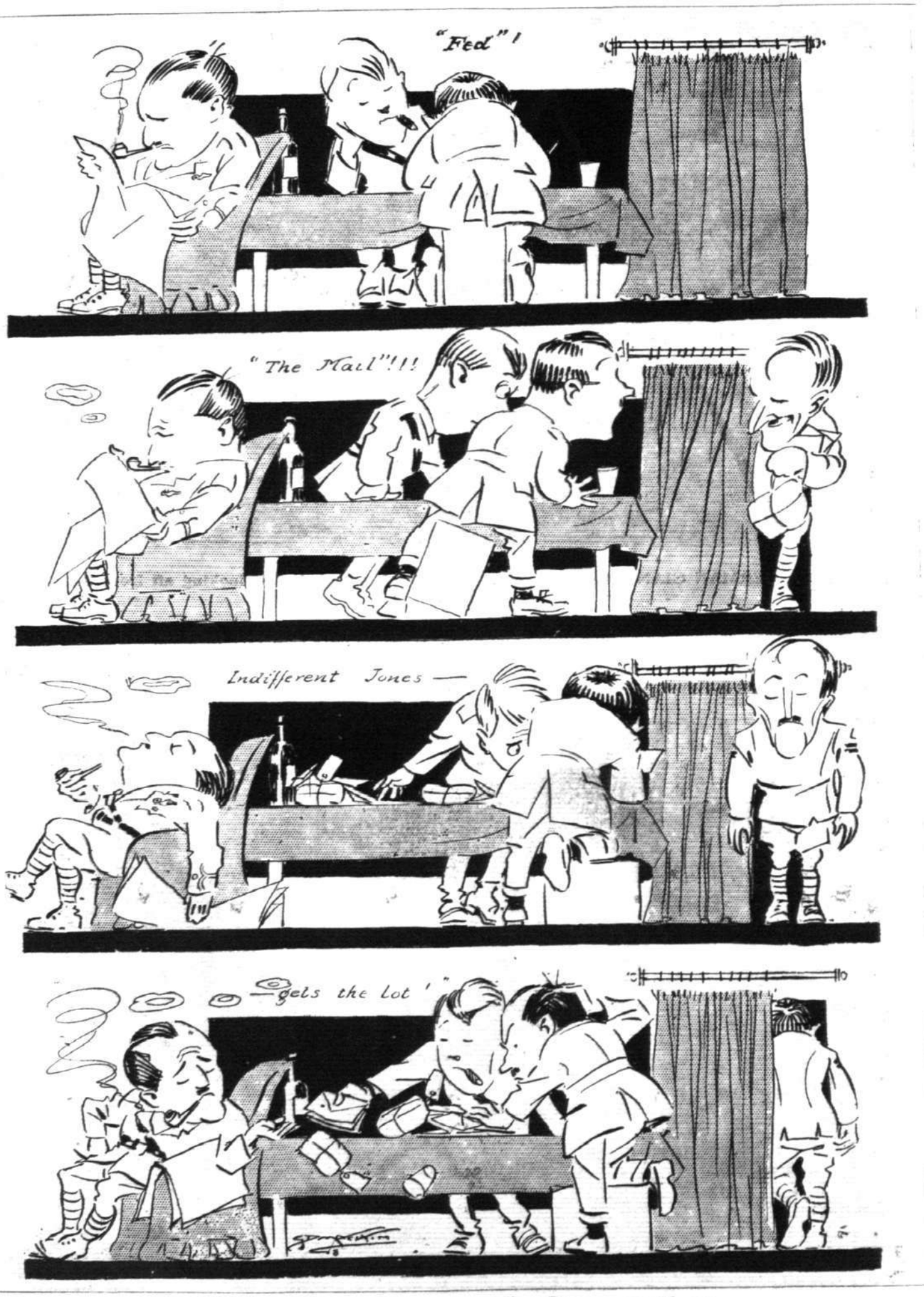
ON BOARD A GERMAN GIANT AEROPLANE.—Photograph showing view looking aft from the port engine *nacelle.*

of Hun morality that, having deprived the town of all food, they not only turned machine-guns on the starving people who tried to escape, but did their utmost to prevent us from succouring them. The gratitude of the people of Le Cateau is said to have been very touching, and one of the proudest records of No. 35 squadron is that they later received the special thanks of the Maire of the town on behalf of the hundreds of his relieved citizens.



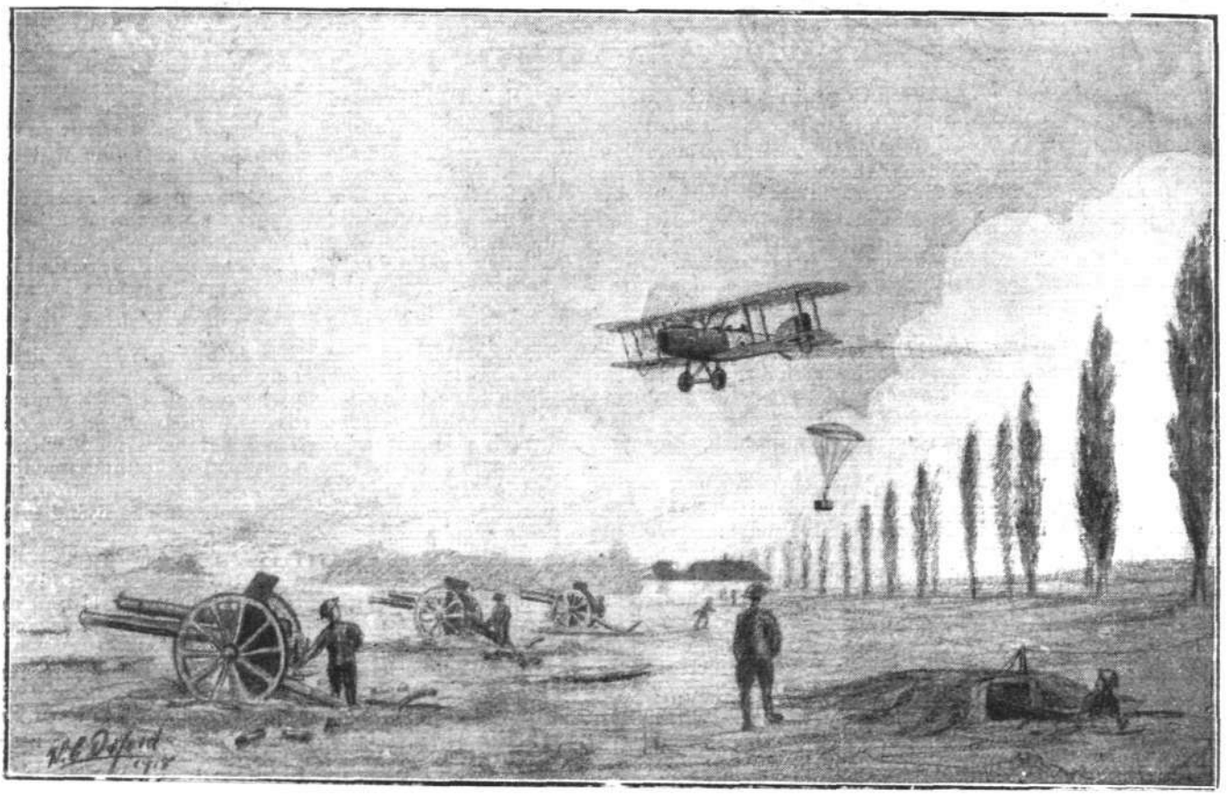
THE NOSE OF A GERMAN GIANT AEROPLANE.—Photograph taken from the port engine *nacelle.*

Apropos this means of bringing aid to the stranded people, we have received a sketch, amongst drawings of similar and other incidents, from W. C. Orford with the B.E.F. in France, and an actual eye-witness of the episodes he chronicles. The particular sketch in this case, which we reproduce, he refers to as follows :—" The advance at times was so fast that it was impossible for the transport to keep pace with us, and more than once our rations came by air. My sketch



With the Army of Occupation

Scene : Squadron Mess—any non-flying day.'



A "Grub-'bus" dropping provisions to isolated advance-troops—*From a sketch by W. C. Orford*

shows a 'grub-bus' dropping tins of 'bully' and biscuits by parachute by my battery in action. It usually resulted in a scramble between the local inhabitants and our boys. In fact, it was about the only thing that would tempt them out of their cellars."

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"FROM O'D., the "Mad Irishman," we have received the following "Dream Flights," being described by "O'D." as "Facts, Fads, and Fancies":—"As an inventor who has been given the 'Bird' by several firms, and the 'Boot' by the Service, what is written here should not be taken as 'gospel,' but supplies food for reflection. Budding inventors—and ull-fledged ones—digest! I fell asleep in 1914 and walked into the R.N.A.S.—lucky it was not the R.F.C. I dreamt. Went for a flight one day in an old 'Moran.' Funny thing that though I was in it I could see all over and under the machine, noticed there was no dihedral angle and yet the roll was very little. Why? A bird whispered in my ear, 'The rolling axis is at a point above the weight.' 'Of course,' I said. I went up in a 'Camel,' nearly got seasick; that bird must have pitied me. It said, 'Silly blighters have got half the weight through the rolling axis.' Landed one day in a Handley full up with bombs; never a jar. Bird said 'Got all the weight under the main lift.' Came back from France another day full of pilots from stem to stern. Landed. BUMP! up she goes! all spilled out through hatchway. Says birdie, 'Think it out.' I did. Fixed a weight under the point of suspension of a stick balanced in the centre. It always came level after oscillation. Halved the same weight and fixed the pieces at each end of the stick. Very unstable. Mem.: Don't distribute weight fore and aft of main lift. Heard a whisper in my ear, 'Well, have you thought out the dihedral angle?' So I thought, 'Why hasn't a flat bottom boat got a keel? and why should a cutter under sail have such a great tendency to right itself if the wind lulls? keel must be below axis of roll?'

"Another day soared aloft in a 'scout,' very fast machine. I was with the pilot, yet there was only the pilot there. He started 'stunting' got her into a nose dive about 10,000 up and raced for mother earth about 400 an hour. Twiddled the joy-stick to all points of the compass. Nothing doin', started to say 'And forgive—,' when the bird said 'Down tail and keep it down,' and out she came upside down! Says the bird when the pilot's hair came to rest, 'Throw an arc of a circle in the air and watch it try to complete the whole circle as it falls And next time you're up don't try and convince the aerofoils that they ought not to follow their own path, when they are doin' the knots in the direction of *Gravity pull.*'

"That reminds me, talking of gravity pull, why does an aeroplane stall?"

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THE ubiquitous reporter has once again led us astray. Only two slips in as many lines, that's all! In last week's little humorous reference in "Airisms" to a *de luxe* 'plane, Colonel W. Bristow, R.A.F.—*not* Captain, as reported—did *not*, as again reported, say the machine was in North London—although he did say there was accommodation for about 90 passengers. And in this latter, as we can vouch for, as in other details as mentioned in a friendly chat, Col. Bristow is correct. In fact the machine in question has long been watched by us, although we have refrained from direct reference to it for obvious reasons. Very shortly now, however, full particulars of this remarkable 'plane will be available, and will duly find space in the pages of FLIGHT.

A Motor Competition in France

I HAVE it on good authority, says *The Times* Paris correspondent, that a public competition will soon be opened for designs of standard motors suitable for commercial and passenger fliers, and also for "runabouts" to be used by ex-Army fliers for pleasure.

London-Amsterdam Air Service

ACCORDING to the Amsterdam *Telegraaf*, as the British Postmaster-General has expressed himself sympathetically in regard to an aerial mail service between London and Amsterdam, a Government commission of five is proceeding to London on March 3 to make investigations concerning international aerial traffic.

A big Dutch steamship company is said to be interesting itself in the project, and it is estimated that the crossing would take two hours. The service might be continued by Denmark and Norway to Sweden, and then *via* Dantzig to Petrograd.

An International Exhibition in Holland

THE *Handelsblad* announces that an International Exhibition of aviation will be held this summer at Amsterdam.

SOME HEALTH ASPECTS OF AERONAUTICS AS FOUND IN SERVICE PILOTS

By Captain T. S. RIPPON, R.A.F. Medical Service.

THERE are several varieties of pilots in the Royal Air Force. The ordinary pilot who can manage to control an aeroplane under certain limited conditions, the high-flyer, who can go to 20,000 ft. and stay there for several hours without distress, the fighting scout, who possesses " nerve " and skill, the engineering expert or test pilot and many others.

We should first consider the question of " stress. '

1. *Learning to Fly.*—Anticipation of the first solo is a great strain on the prospective aviator.

Unless he is the right type, he shows signs of breakdown before he has learned even the elements of flying. The first solo is a great strain, and the exhilaration that follows the first successful solo flight is succeeded by a reaction during which there is more or less fatigue of the cardio-vascular, respiratory, and central nervous system, which, however, passes off in a few hours.

2. *Aerodrome Flying.*—Having learned the principles of aviation, the pilot proceeds to fly in the vicinity of the aerodrome. As long as he is flying a reliable machine, and the weather is good, and the pilot does not " stunt," he can continue to fly for an indefinite period without showing any signs of fatigue, provided that he does not overdo it, lives a normal healthy life, and has no outside anxieties or worries.

3. *Cross-country Flying.*—In cross-country flying, especially on high-powered machines, the strain is very much greater, there is the fear of engine failure, which may occur over unsuitable country with the possibility of a crash.

Added to this the pilot has to find his way, try to read a map, work his controls, and keep an eye on the compass.

In addition, he may meet unfavourable weather, and be given the choice of flying at a dangerously low altitude, or going above the clouds and frequently getting lost; with the added anxiety that in the event of engine failure, he cannot see the country he is over until at too low altitude to pick on suitable landing ground.

In cross-country flying, fog or ground mist is the pilot's greatest enemy. Unless exceptionally lucky, he is bound to lose his way, and in the event of a forced landing is comparatively helpless, and very likely to crash into some obstruction.

The strain on the single-seater pilot is greater than the two-seater pilot, as, in addition, he has a sense of loneliness.

Irrespective of the type of machine, this is accentuated at heights in the majority of cases.

Inability to stand heights is not infrequently as much psychological as due to distress caused by insufficient oxygen.

4. *Active Service Flying.*—It is not necessary to do more than very briefly refer to the colossal strain of flying on active service.

Exposed day after day to anti-aircraft fire, seeing one's friends go down in flames, the cumulative strain ultimately ends in complete nervous breakdown, unless they are given a rest when the symptoms commence.

Commercial Flying.

But active service and high-flying is a specialised form of aeronautics, and in the future, the majority of aviators will fly under favourable conditions.

There will still be the strain of cross-country flying, but it will be enormously reduced, and I agree with the late Captain Hucks that the strain on a Handley-Page pilot, doing regular trips between London and Liverpool, would not be more than the driver of a London motor-'bus, or the captain of an Atlantic liner.

Pilots must be carefully selected and graded according to the particular kind of work they do.

The majority of young healthy men with sporting instinct can learn to fly. Some, however, are alert, enthusiastic, and endowed with good " hands," others are slower, steadier, more reliable, but not so spectacular.

Regular flying under favourable conditions is a healthy occupation; it keeps a man fit and in good tone, although he takes no other physical exercise.

We are inclined to over-estimate the danger and stress of flying, on account of the fact that flying high-speed machines on active service produces a large number of cases of " stress of service " or flying sickness, and many accidents. Now the War is practically over, the automatically stable, slow-speed aeroplane will return, the large passenger-carrying 'bus will be a routine way of taking us for week-ends to the South of France, and we shall fly machines suitable to our age, temperament, and sporting capacity. " Air sickness " will take its place in the nomenclature of disease as an occupation neurosis, and all the manuals of medicine will require an extra chapter added to bring them up to date.

The large number of pilots who have qualified recently is a proof that the aviator is not a " super-man."

The majority of our candidates do not come from the Cavalry or Public Schools, and yet the standard of flying required before the pilot obtains his wings is much higher now than in the early days when we had the pick of the army.

The statement that the aviator must be the fittest of the fit is no longer accepted by everyone.

We have many pilots who are physically unfit according to the ordinary standards who are amongst our best pilots.

Flying is an occupation where the man with a strong personality can overcome physical and temperamental defects, and every man with keenness, determination, character, alertness, and who is enthusiastic about flying is certain of being successful.

Can I Learn to Fly?

Now that the civilian schools of flying are advertising for pupils many young sporting men (and girls too) are asking themselves: Can I learn to fly, or is there something wonderfully difficult about it?

As one who has examined a large number of pupils who have failed to learn to fly, the following points will enable the reader who is considering the question to decide for himself whether or not he has the aptitude.

(1) *Family History.*

What were your father and mother like?

Did they suffer from nervous breakdowns, or were they fond of outdoor games and sports? You may have inherited good or bad nerves from them.

(2) *Early Life.*

What was your record at school?

If you were the ordinary healthy schoolboy who was as good at games as the other boys and occasionally got into trouble through breaking the regulations, you are alright. If you were a very good boy and won prizes and had to wear spectacles through over-studying—be careful. Bad eyesight and a studious sedentary life, without playing games, does not fit a man for any kind of sport.

(3) *After Leaving School.*

What sort of a life did you lead? Did you join any athletic club—football, cricket, tennis, golf, swimming—and did you play in any competitions? if so, you will be successful. But if you lived a sheltered life avoiding the rough places or strenuous games, and when you did try your hand at any games you found you were invariably unsuccessful—don't try to learn to fly. If you have not driven a motor-cycle or car, or put on a pair of boxing gloves in your life—don't toy with a joy-stick. Flying is not so dangerous as driving a racing car—but would you like to drive a racing car?

Why do you Want to Learn to Fly?

If it is the idea of sport—the exhilaration of speed—the novelty—the pioneer spirit is trying a new thing and the desire is to be one of the first to conquer the air, then you will be successful.

Every Man a Pilot

There appears to be a belief in some people that when commercial aviation actually opens to the public, only a limited number of very fit men will be able to fly. This belief is due to the fact that flying a high-speed fighting machine at great heights, exposed to anti-aircraft fire and attack by hostile aircraft has caused a number of pilots to suffer from various symptoms due to fatigue of the nervous system, associated with lack of oxygen.

Whilst the pilot of a passenger-carrying aeroplane should be physically in perfect condition, the physical qualifications of a pilot of an aeroplane of average speed, flying not higher than 10,000 ft. under favourable conditions, are those of the ordinary healthy young man who plays cricket and tennis in the summer, and football or hockey in the winter.

With regard to the passenger, it is obvious than anyone suffering from heart disease, consumption or nervous breakdown should not be allowed to go up, but the change in the atmospheric pressure and the amount of oxygen at varying heights under 10,000 ft. is compensated by the automatic action of the heart and lungs, so that no symptoms would be noticed in an ordinary passenger flight.

FLIGHT

Personals.

Casualties

Lieut. HATTON CHARLES CONRON. R.A.F., who was officially reported missing on May 18, 1918, and now presumed killed, was the eldest son of the late Hatton Ronayne Conron, of Mayfield, Sussex.

Lieut. B. CARLETON SMITH, R.A.F., who was killed on February 6, at the age of 19, in an accident while flying a German Gotha at Cologne, was the only son of the late McDougal Carleton Smith, Cheadle, Cheshire, and Mrs. Carleton Smith, Brampton, Aston-on-Clun, Shropshire.

Capt. HAROLD HARTLEY BARON, R.A.F., whose death occurred on February 7, from disease contracted during the German South-West African campaign, was the second son of Mr. and Mrs. John Baron. He was educated at Tonbridge School and Downton Agricultural College, and was fruit-farming in Rhodesia when war was declared. He joined the 1st Rhodesian Regiment on August 4, 1914. At the termination of the German South-West African campaign he came home to take up flying, obtained his "wings" in December, 1915, and proceeded to France in June, 1916, where he was promoted captain and flight-commander in March, 1917, and did most valuable artillery work in France and Flanders for over a year. For some time he was on the Italian front, since when he had been instructing.

Capt. FRANCIS ERNEST JOHN, R.A.F., Croix de Guerre (late of Middlesex Yeomanry), died on February 26, at 52, Fairhazel Gardens, S. Hampstead, of pneumonia following influenza.

Lieut. VERNON JOHN HAMMOND, R.A.F., who died on February 23, at the age of 27, at "The Firs," Gidea Park, of septic pneumonia following influenza, was the second and only surviving son of John George Hammond.

Capt. HOWARD REDMAYNE HARKER, M.C., R.A.F., died on February 27, at the age of 28, of pneumonia in the Officers' Military Hospital, Tidworth.

Lieut. S. A. KEMP, R.A.F., who died on February 21, of influenza, at No. 20 General Hospital, Camiers, France, was the eldest surviving son of Mr. and Mrs. Kemp, Belper, Marchmont Road, Wallington, aged 19 years.

Capt. BENZIL ROBERT THURSTAN, R.N.A.S., attached R.A.F., Cranwell Air Station, died on February 24, at the 4th Northern General Hospital, Lincoln, of pneumonia following influenza.

Married

Lieut. J. J. BOYD-HARVEY, Welsh Horse, and R.A.F., eldest son of the late Mr. and Mrs. Boyd-Harvey, Tondu House, Bridgend, was married on February 20 at St. Peter's, Budleigh Salterton, to KATHERINE, daughter of the late Mr. and Mrs. Carlile FRASER, Budleigh Salterton.

MARTIN DALE, of 32, Brechin Place, S.W., son of the late Robert Norris Dale, of Bromborough Hall, Cheshire, was married on February 20, at St. James's, Piccadilly, to ROSA ELIZABETH, widow of Herbert S. BOULT, of Aigburth Lodge, Liverpool, eldest daughter of Edward Edmondson, of Liverpool.

To be Married

The engagement is announced between Capt. GEOFFREY GAWEN BRAITHWAITE, the Queen's Royal West Surrey Regiment and R.A.F., son of Mr. and Mrs. Cecil Braithwaite, of Bridley Manor, Worplesdon, and DOROTHY MARY, daughter of the Rev. and Mrs. F. W. SEATS, of the Rectory, Minchinhampton, Glos.

The engagement is announced between Lieut. HENRY WINKWORTH, Queen's Bays and R.A.F., elder son of Stephen D. Winkworth, 13, Craven Hill Gardens, W., and Walton-on-the-Hill, Surrey, and MARGOT, only daughter of Robert DONALD, Heath Lodge, Walton-on-the-Hill.

Items

The will of Lieut. GEORGE ST. VINCENT PAWSON, R.A.F., of Sibton Park, Lyminge, Kent, has been proved at £7,851.

HANDLEY-PAGE PULLMANS

IN order to afford the general public an opportunity of seeing what degree of comfort can be arranged for on a large aeroplane Messrs. Handley-Page have had the *fuselage* of one of their twin-engine machines fitted up with comfortable chairs, electric lamps, mirrors, etc. This is now on view at Selfridge's, the exhibition being opened on Monday by Lord Morris, of Newfoundland, who said that last month over 700 passengers had been taken in Handley-Page machines to France.

The *fuselage* has accommodation for 17 passengers, these being arranged along the two sides of the saloon, and there is also a seat for an outside passenger in the cockpit formerly occupied by the forward machine gunner in front of the pilot.

At a subsequent luncheon at Prince's Restaurant, Mr. A. Best, of Selfridge's, proposed the toast of "Mr. Handley-Page." He said he saw no reason why commercial aeroplanes should not be used by business houses, and Selfridge's, as soon as possible, would use them in every conceivable way they could be used. He could imagine their buyers flying to get ahead of other buyers of carpets at Smyrna.

Mr. Handley-Page, in his reply, said that they were starting an entirely new company, the Handley-Page Air Transport Company, which would be at the disposal of anybody, with machines to fly people between this country and the Continent, and from there through its allied companies as far as it was possible for an aeroplane at present to reach. Their machines had already reached down beyond the centre of Africa, and to Delhi and Calcutta. This transport company were going to do the work with their own machines, and they would carry passengers and freight at a price which would pay anybody to utilise the service. The only way in which they could do this would be by having an enormous volume of goods and large numbers of passengers with a small running cost. Their policy would be to run aerial passenger omnibuses or motor lorries, and not aerial racing cars. With regard to present methods of carriage, they would not be competing with anyone, but adding to the facilities already existing. They would relieve the railways of fast traffic, which in the past had been their bugbear.

The service would begin as soon as the Air Convention was signed. Their arrangements were made; machines and pilots were ready to fly people to the farthest parts of the Empire. In order to carry the scheme into effect, several gentlemen had placed their services at his disposal. Mr. E. J. Bray, until recently general European agent of the National Railways of Mexico, would be their first aerial traffic manager. On the flying side he would have the assistance of several officers who had played a distinguished part in the Air Service in the War.

Proposed Passenger Services

THE Tynemouth Corporation, having received an offer from a company to run pleasure trips with four-seater biplanes, has referred it to a sub-committee with plenary power to act on the understanding (*a*) that sole permission will not be granted; and (*b*) that the proposed service shall not interfere with the free enjoyment of the foreshore.

A project is on foot to establish an air service between Leicester and Hunstanton with the object of conveying business people between the two places daily.

At the last meeting of the Leeds Chamber of Commerce, Sir John McLaren, who presided, moved a resolution expressing the opinion of the Council that the commercial use of aircraft in the transit of passengers, mails and goods had become a question of immense moment, and calling the attention of the City Council to the desirability of placing before the Government the claims of Leeds as an aeroplane centre and clearing-house for the West Riding of Yorkshire. The resolution was carried.

The Great Northern Aerial Company propose to make one of their stations at Bray, and have applied to the Bray Urban Council for permission to build hangars for six large machines.

THE ROYAL AIR FORCE

London Gazette, February 25

The following temp. appts. are made at the Air Ministry :—

Staff Officer, 2nd Class.—(Air.)—Capt. (Hon. Maj.) W. Pennefather, and to be actg. Maj. whist so employed ; Feb. 1.

Staff Officers, 3rd Class.—And to be actg. Capts. whilst so employed :—Lieut. A. J. Clark ; Jan. 6. Sec. Lieut. A. D. Watts ; Feb. 7.

The following temporary appointments are made :—

Staff Officer, 2nd Class.—Maj. W. H. Yeatman-Biggs ; Aug. 13, 1918.

Staff Officer, 3rd Class.—Lieut. (actg. Capt.) P. H. Barr, and to retain his actg. rank whilst so employed, vice Capt. A. H. King ; Feb. 12.

Flying Branch.

Maj. A. W. Tedder to be actg. Lieut.-Col. whilst employed as Lieut.-Colonel (A.) ; July 23, 1918.

Capt. (actg. Maj.) O. Stewart, M.C., A.F.C., retains the actg. rank of Maj. whilst employed employed as Maj. (A.) from (T.) ; June 18, 1918.

Capt. J. W. Somers to be Capt. (A.), from (Ad.) ; Feb. 4.

The following are granted temp. commns. as Sec. Lieuts. (A.) :—E. Exton (Sec. Lieut., Midd'x R., T.F.) ; June 30, 1918. J. C. Ambler (Lieut., Lan. Fus., T.F.), and to be Hon. Lieut. ; Sept. 1, 1918.

Prob. Flight Offr. E. F. Green (late R.N.A.S.) is granted a temp. commn. as Sec. Lieut. (A.) ; Nov. 16, 1918 (substituted for notification in *Gazette*, Dec. 10, 1918).

Sec. Lieut. M. Furtney (late Gen. List, R.F.C., on prob.) is confirmed in his rank as Sec. Lieut. (A.) ; June 13, 1918.

Sec. Lieut. A. Sommerfelt (late Gen. List, R.F.C., on prob.) is confirmed in his rank as Sec. Lieut. (Obs. Offr.) ; May 20, 1918.

The following relinquish their commns. on ceasing to be employed :—Lieut. D. A. McDonald (Lieut., Can. For. Corps), Lieut. (Hon. Capt.) N. W. Taylor (Capt., Can. A.S.C.) ; Dec. 7, 1918. Lieut. J. H. Reid (Lieut., Quebec R.) ; Dec. 12, 1918. Lieut. (actg. Capt.) W. A. Landry (Lieut., Temp. Capt., Can. F.A.) ; Dec. 21, 1918. Lieut. (Hon. Maj.) D. A. MacRae (Maj., Alb. R.) ; Jan. 11. Sec. Lieut. (Hon. Lieut.) G. H. Rogers (Lieut., E. Ont. R.) (substituted for notification in *Gazette* of Feb. 11), Sec. Lieut. H. G. Smith (Lieut., Nova Scotia R.) ; Jan. 13. Lieut. J. S. Balfour (Lieut., E. Ont. R.) ; Jan. 18. Lieut. J. M. Stubbs (Lieut., Hussars) ; Jan. 25. Sec. Lieut. (Hon. Lieut.) L. R. James (Lieut., Brit. Col. R.) ; Jan. 28. Sec. Lieut. V. G. Hodges (Sec. Lieut., S. Wales Bord., T.F.) ; Feb. 7. Lieut. A. R. Harrison (Lieut., W. Yorks R.) (T.F.) ; Feb. 8.

The following are transfd. to the Unemployed List :—Lieut. W. D. Vernon ; Jan. 13. Capt. D. B. M. Hume, Lieut. (Hon. Capt.) C. H. M. Willson ; Jan. 15. Sec. Lieut. H. M. Stringer ; Jan. 16. Sec. Lieut. A. S. Wellby ; Jan. 17. Sec. Lieut. Conrad Volk, Lieut. F. P. Williams ; Jan. 18. Lieut. L. Lievers, Lieut. J. C. D. Whelan ; Jan. 21. Sec. Lieut. J. H. Bolam (Northumb. Fus.), Lieut. P. L. Ward (R.F.A.) ; Jan. 22. Lieut. E. W. Lindeberg ; Jan. 23. Sec. Lieut. J. S. Machin, Sec. Lieut. R. C. Stephens, Sec. Lieut. R. E. Skinner ; Jan. 24. Sec. Lieut. E. P. Senior, Sec. Lieut. (Hon. Lieut.) W. R. Steed ; Jan. 25. Sec. Lieut. H. Fox, Lieut. D. C. Hopewell, Lieut. A. Hodgkins, Capt. W. V. Simons, Sec. Lieut. J. D. Williams ; Jan. 26. Lieut. A. E. B. Craddock (Arg. and Suthd. Highrs., T.F.) ; Sec. Lieut. J. A. Horner, Sec. Lieut. J. A. E. Steel ; Jan. 27. Lieut. B. N. Garrett, Lieut. E. Lee ; Jan. 28. Sec. Lieut. H. Oates, Sec. Lieut. (Hon. Lieut.) A. D. Young ; Jan. 29. Lieut. A. B. Hill, Lieut. J. A. Yarrow ; Jan. 30. Lieut. D. Cushing, Sec. Lieut. A. M. Daniels, Sec. Lieut. A. Gladwin (York and Lancs. R.), Maj. K. K. Horn, M.C., Sec. Lieut. E. H. Leather, Lieut. F. Lupton, M.C. (Sea. Highrs., S.R.), Sec. Lieut. E. A. Welsford ; Jan. 31. Sec. Lieut. D. D. Ashley, Lieut. P. A. A. Boss, Sec. Lieut. F. Brownlee (Lieut. R.W. Kent R.), Sec. Lieut. G. McGregor Chalmers, Lieut. P. T. Holligan, D.F.C., Lieut. (actg. Capt.) H. Liver, Lieut. J. Lowe, Sec. Lieut. J. W. Sandham, Sec. Lieut. (Hon. Lieut.) J. G. Towers ; Feb. 1. Sec. Lieut. C. F. Brown (D.L.I.), Sec. Lieut. H. Lapish, Lieut. E. A. C. Lawson (Capt., R.F.A., T.F.), Lieut. J. A. Strugnell ; Feb. 2. Sec. Lieut. W. E. Cook, Capt. A. G. Waller, Lieut. G. K. Walker ; Feb. 3. Lieut. R. G. C. Adams, Lieut. H. W. Connell, Sec. Lieut. C. W. Grant, Sec. Lieut. A. R. Levey ; Feb. 4. Lieut. J. Adamson, Sec. Lieut. C. G. Bateson, Sec. Lieut. E. C. Bethnell, Sec. Lieut. G. C. S. Bowring, Lieut. F. Catterall (Lancs. Fus., T.F.), Sec. Lieut. H. J. Collar, Lieut. F. Fowler, Sec. Lieut. W. Greenwood, Lieut. (actg. Capt.) W. H. Hewson, Lieut. J. Hirst, A.F.C., Lieut. A. Hollis (Lieut., Hamps. R. T.F.), Sec. Lieut. N. A. Horlock, Sec. Lieut. A. L. Jordan, Lieut. D. Kingsley, Capt. J. L. Leith, M.C. (Lieut., Hamps. R.), Sec. Lieut. J. B. Smith, Sec. Lieut. W. F. Smith, Lieut. F. J. Walsh, Lieut. E. H. Williams ; Feb. 5. Sec. Lieut. T. C. Greeley, Sec. Lieut. E. C. James, Lieut. F. Matthews ; Feb. 6. Sec. Lieut. A. A. T. Favard, Lieut. W. C. M. Harbottle, Sec. Lieut. (Hon. Lieut.) C. R. Leeke (Lieut., R.H. and R.F.A., T.F.), Lieut. G. D. Smith, Lieut. W. P. T. Watts ; Feb. 7. Sec. Lieut. A. W. Amies, Sec. Lieut. (Hon. Lieut.) L. O. Atkins (E. Surr. R.), Lieut. (actg. Capt.) C. Bowman, D.F.C., Lieut. F. J. L. Bishop, Sec. Lieut. A. L. Cormie, Sec. Lieut. W. H. Drew, Lieut. J. P. Everitt, Lieut. H. H. Gillingham, Sec. Lieut. E. L. Hallett (R. Suss. R.) (T.F.), Sec. Lieut. W. H. Hutt, Lieut. K. P. Hunt, Lieut. J. C. Keyser (Lieut., Middx. R.), Lieut. W. B. Lane, Sec. Lieut. M. J. F. Underwood, Sec. Lieut. H. E. Yates ; Feb. 8. Lieut. H. C. Adams, Sec. Lieut. L. H. Fray, Sec. Lieut. D. G. Paterson, Sec. Lieut. S. A. Scriven, Sec. Lieut. L. Townsend (North'd Fus.) ; Feb. 9. Sec. Lieut. A. Bell, Sec. Lieut. B. C. Fairchild, Sec. Lieut. M. G. Hill (Sec. Lieut., Lond. R.), Sec. Lieut. (Hon. Lieut.) L. C. Pierce (R.H. and R.F.A.) ; Feb. 10. Lieut. H. Arnold, Sec. Lieut. (Hon. Lieut.) T. S. Bustard (R.A.M.C.), Sec. Lieut. J. C. Carson, Sec. Lieut. J. Erskine, Capt. W. R. B. Cifford, Lieut. A. S. Harris-Heller, Lieut. (actg. Capt.) H. W. Lee, Sec. Lieut. A. L. Lightowler, Lieut. E. L. Lister, Sec. Lieut. W. Lowry, Lieut. J. McLee, Sec. Lieut. R. Maynard, Lieut. (actg. Capt.) T. P. Middleton, Sec. Lieut. H. H. Mortiboy, Sec. Lieut. H. F. Waldock, Sec. Lieut. S. Warburton ; Feb. 11. Sec. Lieut. J. R. W. Adamson, Capt. (actg. Maj.) F. A. Bates, M.C. (Denbigh Yeo.), Lieut. A. J. E. Behm (Lond. R., T.F.), Lieut. E. H. Chater, Lieut. E. S. Clark, Sec. Lieut. L. S. Greenaway, Sec. Lieut. J. S. Heggie, Lieut. (actg. Capt.) R. S. S. Ingram, Lieut. A. O. Matt, Sec. Lieut. A. G. V. Reeves, Sec. Lieut. (Hon. Capt.) J. Schofield, M.C. (Essex R., T.F.), Sec. Lieut. J. Witton ; Feb. 12. Capt. G. Alchin (R.F.A., S.R.), Lieut. R. I. Metcalfe ; Feb. 13. Lieut. H. A. Airey, Lieut. J. W. Boumphrey (Ches. Yeo., T.F.), Lieut. F. Edsted, Lieut. C. O. Meeke, Lieut. W. Robson, Sec. Lieut. P. Webster, Lieut. (actg. Capt.) J. A. S. Wright ; Feb. 14. Sec. Lieut. F. R. Pemberton ; Feb. 15. Sec. Lieut. H. E. Higginson ; Feb. 16. Sec. Lieut. H. E. Archdekin, Sec. Lieut. K. W. Crosby, Sec. Lieut. W. D. Hayter, Sec. Lieut. J. E. S. Lytell ; Feb. 23. Sec. Lieut. G. Woolf ; Feb. 24. Lieut. S. J. Hawthorn (Lieut., N. Staffs. R.) (T.F.) ; Feb. 25.

The following Lieuts. relinquish their commns. on account of ill-health, and are permitted to retain their rank :—H. B. Browne (contracted on active service). W. W. Brymer (R.G.A., T.F.) (contracted on active service). J. H. Harkin, F. Rennison (contracted on active service). H. E. Startin contracted on active service) ; Feb. 26.

Sec. Lieut. F. Seddon relinquishes his commn. on account of ill-health contracted on active service, and is permitted to retain his rank ; Feb. 26.

Sec. Lieut. C. O. Carson resigns his commn. in order to resume his medical studies, and is permitted to retain his rank ; Feb. 26.

Sec. Lieut. W. G. White is antedated in his appointment as Sec. Lieut. (A.) ; July 31, 1918.

Sec. Lieut. T. H. Barry is antedated in his appointment as Sec. Lieut. (Obs. Officer) ; April 4, 1918.

The initials of Lieut. (actg. Capt.) F. D. Grant are as now described, and not as stated in *Gazette* Dec. 6, 1918.

The notification in *Gazette* June 11, 1918, concerning B. C. Dupon is cancelled.

The notification in *Gazette* May 31, 1918, concerning Sec. Lieut. R. Joyce Woods is cancelled.

The notification in *Gazette* June 28, 1918, concerning Sec. Lieut. L. L. Saunders is cancelled.

The notification in *Gazette* May 28, 1918, concerning Sec. Lieut. D. B. Sinclair is cancelled.

Administrative Branch.

Capt. A. J. Brown, M.C., to be Capt. from (A.) ; Nov. 28, 1918.

Lieuts. to be actg. Capts. whilst employed as Capts. :—R. N. Giles, P. J. Murphy ; Oct. 1, 1918. J. W. Winter ; Nov. 11, 1918. (Hon. Capt.) G. Chetwynd-Stapylton ; Dec. 1, 1918.

J. A. McLaren, M.C. (Lieut., L'pool R.) is granted a temp. commn. as Lieut., and to be actg. Capt. whilst employed as Capt. ; Oct. 25, 1918.

Capt. J. F. Hay to be graded for purposes of pay as Lieut. whilst employed as Lieut. from (S.) ; Jan. 8.

Lieuts. (A.) to be Lieuts. :—D. H. Rudd ; Oct. 21, 1918. W. Dobson ; Oct. 27, 1918. B. H. Caswell ; Nov. 2, 1918. G. J. Ogg ; Dec. 4, 1918. D. H. Lees ; Dec. 5, 1918. C. E. Bacon ; Dec. 19, 1918. P. S. L. Lee ; Dec. 20, 1918. G. N. Silvester ; Jan. 14. A. E. N. Jansen ; Feb. 1. G. R. Priestley ; Feb. 11.

Lieut. F. J. Clark to be Lieut., from (A. and S.) ; Nov. 29, 1918.

Lieuts. (O.) to be Lieuts. :—N. V. Harle, J. S. Stevenson ; Nov. 27, 1918. A. V. Matt ; Dec. 19, 1918. N. I. Brockbank, D.F.C. ; Jan. 18.

Sec. Lieuts. to be Sec. Lieuts., from (A.) :—J. E. G. Rochemont, A. H. Bradley ; Nov. 22, 1918. A. K. Whiteman, C. H. S. Pain ; Dec. 3, 1918. A. B. D. McConnell ; Jan. 3. E. T. Wales ; Jan. 23.

Sec. Lieut. H. Newsham to be Sec. Lieut., from (A. and S.) ; Dec. 12, 1918.

Sec. Lieuts. to be Sec. Lieuts., from (O.) :—J. M. Holling, J. MacD. MacKinnon ; Nov. 14, 1918. F. W. P. Clark ; Nov. 19, 1918. C. C. Dance ; Dec, 2, 1918. W. H. Bentley ; Dec. 5, 1918. J. E. West ; Dec. 10, 1918. R. P. H. West ; Dec. 20, 1918. C. H. Cutting ; Jan. 7. E. H. Leavers ; Jan. 20. S. St. C. Stone ; Jan. 27.

Sec. Lieut. A. E. P. Smith (late Gen. List, R.F.C., on prob.) is confirmed in his rank as Sec. Lieut. ; April 1, 1918.

The following relinquish their commns. on ceasing to be employed :—Lieut. J. V. Hoskins (R. Welsh Fus., T.F.) ; Jan. 4. Maj.-Genl. F. C. Heath-Caldwell, C.B. ; Feb. 1.

The following are transfd. to Unemployed List :—Sec. Lieut. G. Allison-Beer, Sec. Lieut. J. Harvey, Lieut. (Hon. Capt.) G. H. Simpson ; Jan. 24. Capt. E. H. Bellew (substituted for notification in *Gazette*, Jan. 31), Sec. Lieut. W. E. Gemmell ; Jan. 25. Sec. Lieut. J. M. Adams (Gord. Highrs., T.F.), Lieut. T. S. Stewart ; Jan. 26. Sec. Lieut. H. E. Sugden ; Jan. 28. Maj. W. C. Campbell, D.S.O., M.C., Sec. Lieut. J. R. Senior ; Jan. 29. Sec. Lieut. W. P. Hotson, Sec. Lieut. F. A. McK. Slocombe ; Jan. 30. Sec. Lieut. E. C. Chapman ; Jan. 31. Sec. Lieut. F. Chapman, Sec. Lieut. E. W. Dunning, Sec. Lieut. W. R. E. Hartfall ; Feb. 1. Sec. Lieut. H. Hinchcliffe, Sec. Lieut. A. G. J. Littlewood ; Feb. 2. Sec. Lieut. J. Cartwright, Capt. E. Johnson (W. Yorks R.) ; Feb. 4. Lieut. (actg. Capt.) A. J. Spelling ; Feb. 6. Lieut. T. J. H. Fryer, M.C. Feb. 7. Sec. Lieut. S. F. J. Fells, Lieut. C. E. Smith ; Feb. 8. Sec. Lieut. (actg. Lieut.) W. A. Carroll, Sec. Lieut. J. Hartley, Capt. (actg. Maj.) E. G. A. Lefrère ; Feb. 9. Sec. Lieut. S. J. Fortescue ; Feb. 10. Sec. Lieut. W. L. Angell, Sec. Lieut. J. A. Downes, Sec. Lieut. W. E. Laing ; Feb. 11. Lieut. (actg. Capt.) W. Bowring (Lieut., Sco. Rif.) ; Feb. 12. Lieut. H. T. L. Brittain, Sec. Lieut. A. E. Leggatt ; Feb. 14. Sec. Lieut. E. Telfer ; Feb. 15. Sec. Lieut. (actg. Capt.) H. W. Burleigh ; Feb. 19.

Sec. Lieut. D. H. C. Newth is removed from the R.A.F. ; Jan. 30.

Capt. A. G. A. Hodges relinquishes his commn. on account of ill-health ; Feb. 26.

Lieut. W. J. Terry relinquishes his commn. on account of ill-health contracted on active service, and is permitted to retain his rank ; Feb. 26.

Lieut. (Hon. Capt.) W. P. Spooner (Essex E.) relinquishes his commn. on account of ill-health ; Feb. 26.

The following Sec. Lieuts. relinquish their commns. on account of ill-health, and are permitted to retain their rank :—S. R. S. Burnett, E. E. Watson ; Feb. 26.

The notification in *Gazette* Oct. 4, 1918, concerning Lieut. (actg. Capt.) A. S. Thompson is cancelled.

The notification in *Gazette* Jan. 31 concerning Lieut. C. B. Godfrey is cancelled.

Technical Branch.

Capt. F. R. Freeman to be Capt. (Grade A) from (Ad.) ; Oct. 21, 1918.

Lieuts. to be actg. Capts. while employed as Capts. (Grade B) :—G. J. Engwell ; Aug. 1, 1918. A. H. Dye, T. B. Whitcomb ; Sept. 27, 1918. C. H. Boyle ; Nov. 10, 1918. G. G. Kitson ; Nov. 26, 1918.

Sec. Lieut. (actg. Lieut.) W. W. Hammond to be ac.g. Capt. while employed as Capt. (Grade B) ; Jan. 30.

Sec. Lieut. (Hon. Lieut.) A. E. Thorne to be actg. Capt. (Grade B) while specially employed ; Jan. 1.

Lieut. F. T. Wheatley to be graded for purposes of pay as Lieut. while employed as Lieut. (Grade B) ; Nov. 13, 1918.

Lieuts. to be Lieuts. (Grade B) :—F. W. Webster, from (A) ; Sept. 16, 1918. S. Buckenham, from (K.B.) ; Nov. 4, 1918. N. Couve, from (O.) ; Nov. 21, 1918 (substituted for notification in *Gazette* Dec. 24, 1918.

Sec. Lieuts. (actg. Capts.) to be Lieuts., and retain their actg. rank :—R. W. Davies, C. Curwen, C. C. Bracebridge ; April 2, 1918. O. F. Cooke-Yarborough ; Oct. 17, 1918.

Sec. Lieut. (actg. Lieut.) H. H. Maudsley to be Lieut., with pay and allowances of that rank ; Oct. 5, 1918.

Sec. Lieuts. to be actg. Lieuts. while employed as Lieuts. (Grade B) :—R. Fell ; July 1, 1918. F. W. Wheeler ; Aug. 1, 1918. C. G. A. Poole (from Ad.) ; Sept. 1, 1918. N. F. Burch ; Oct. 8, 1918. F. M. Burr ; Oct. 23, 1918. J. O. Cooper (Hon. Lieut.) W. F. J. Matthews ; Nov. 1, 1918. A. L. Flaws, E. J. Wilkins ; Nov. 10, 1918. J. P. Standfast ; Dec. 1, 1918.

Sec. Lieuts. to be Sec. Lieuts. (Grade A), from (Ad.) :—A. Higham, C. H. Parker; Jan. 24. H. B. Hinde; Feb. 1.

Sec. Lieut. S. T. Fowler to be Sec. Lieut. (Grade A), from (Grade B); Feb. 14.

Sec. Lieuts. to be Sec. Lieuts. (Grade B), from (Ad.) :—P. H. C. Martin; Sept. 12, 1918. Hon. Lieut. G. T. Cain; Feb. 10 (and to be Hon. Lieut.).

D. J. Walker is granted a temp. commn. as Sec. Lieut. (Grade A); April 8, 1918.

The following relinquish their commns. on ceasing to be employed :—Maj. F. R. G. Turner (Eng. Lieut.-Comdr., R.N.); Dec. 18, 1918. Capt. J. W. Yuile (Capt., Can. R. Highrs.); Jan. 20.

The following are transfd. to Unemployed List :—Lieut. C. C. Barrett; Jan. 14. Capt. S. P. Purkiss-Ginn; Jan. 22. Sec. Lieut. (actg. Lieut.) G. R. Kull; Jan. 24. Sec. Lieut. T. Bell; Jan. 26. Sec. Lieut. (actg. Lieut.) J. Breckman; Jan. 28. Sec. Lieut. (actg. Lieut.) A. G. Cardwell; Jan. 29. Capt. J. H. Crutch; Jan. 31. Capt. H. Girdlestone, Capt. J. B. Homer, Lieut. T. Lightbody, Capt. W. J. Sinclair; Feb. 1. Sec. Lieut. (actg. Lieut.) R. L. Cobb, Maj. H. F. Fisher; Feb. 4. Sec. Lieut. A. T. B. Dell; Feb. 6. Sec. Lieut. A. B. Evans, Sec. Lieut. F. W. Stiles; Feb. 7. Lieut. S. G. Allen, Capt. (actg. Maj.) W. J. C. Brown, Lieut. G. B. Fielding, Sec. Lieut. P. H. Hall, Capt. H. E. Jarman, Sec. Lieut. J. A. Squire; Feb. 8. Capt. E. D. L. Davies, Sec. Lieut. L. J. Ford; Feb. 9. Sec. Lieut. (actg. Lieut.) F. A. Beale, Sec. Lieut. A. Broadley; Feb. 10. Lieut. C. S. Collingwood, Capt. T. De La Poer Beresford, Capt. F. W. Elstub, Capt. D. McN. Greig; Feb. 11. Capt. G. H. Childs, Capt. (actg. Maj.) F. G. Wilson; Feb. 12. Capt. B. J. Nicholson; Feb. 13. Lieut. E. E. G. B. Lennard; Feb. 14. Sec. Lieut. (Hon. Capt.) H. T. Musker; Feb. 15.

Capt. H. Clayton-Wright relinquishes his commn. on account of ill-health and is permitted to retain his rank; Feb. 25.

Sec. Lieut. (actg. Lieut.) G. Dickson relinquishes his commn. on account of ill-health, and is permitted to retain the rank of Lieut.; Feb. 26.

The following Sec. Lieuts. relinquish their commns. on account of ill-health and are permitted to retain their rank :—C. H. Mackinnon, P. W. Paddon; Feb. 26.

The notifications in Gazette Jan. 3, concerning the following Sec. Lieuts. are cancelled :—R. W. Davies, C. Curwen, C. C. Bracebridge, O. F. Cooke-Yarborough, H. H. Maudsley.

Memoranda.

Capt. E. B. Mills to be actg. Maj. while holding a special appointment at the Ministry of Munitions; Jan. 22.

Sec. Lieuts. to be actg. Capts. without the pay and allowances of that rank :—(Actg. Lieut.) W. A. Winter. H. H. Williams; Dec. 6, 1918.

The following Capts. are confirmed in the rank of Capt. :—G. W. R. Fane, D.S.C., G. E. Williamson, A. H. Pearce, D.F.C., A. T. Wheatley, D.S.C., D.F.C., J. F. Horsey, G. D. Kirkpatrick, C. R. Morrish, D.S.C., H. V. Worrall, D.S.C., R. S. de Q. Quincy, T. R. H. Duff, R. McN. Keirstead, D.S.C., J. Hodson, F. E. Rogers, J. A. Carr, D.S.C., F. D. H. Bremner, I. H. W. Barnato, V. H. Ramsden, J. E. A. Hoare, J. E. Brewin, E. G. Claverley, G. B. Carr, N. Wallis, J. W. Walton, G. F. Browne, W. P. D. C. Scott, T. C. Lloyd.

Lieuts. to be Hon. Capts. :—A. J. Barber, H. F. P. Morris, H. H. Spencer; July 21, 1918. P. Vallette.

E. Clarke (late Sec. Lieut., R.A.F.) is granted the hon. rank of Lieut.; May 29, 1918.

The following are transferred to Unemployed List, from (S.O.) :—Lieut. (actg. Capt.) C. J. S. Holden; Jan. 23. Capt. M. W. Bovill; Jan. 25. Capt. (actg. Lieut.-Col.) F. S. Isaac; Feb. 5. Capt. (actg. Maj.) N. Martin; Feb. 7. Capt. (actg. Maj.) J. M. Nicolle; Feb. 8. Maj. C. Death, Sec. Lieut. (actg. Capt.) A. B. Staples; Feb. 9. Capt. (actg. Maj.) C. C. Boyd Rochfort, Lieut. (actg. Maj.) J. S. Ruttle; Feb. 12. Capt. H. McClelland, D.S.C.; Feb. 16.

Lieut. N. H. Underwood (Lein. R.) relinquishes his commn. on account of ill-health contracted on active service, and is permitted to retain his rank; Feb. 26.

London Gazette, February 28.

The following temporary appointments are made :—

Staff Officers, 3rd Class.—And to be actg. Capts. whilst so employed, if not already holding that rank :—(P.) Sec. Lieut. E. A. Cogswell; Aug. 13, 1918. Lieut. (actg. Capt.) H. C. Pyper; Feb. 1.

The notifications in *Gazette* Sept. 3, 1918, and Oct. 8, 1918, concerning Maj. E. Childers, D.S.C., are cancelled.

Staff Officer, 4th Class (2nd Grade).—The date of appointment of Sec. Lieut. (actg. Lieut.) E. O. Johnson is June 26, 1918, and not as stated in *Gazette*, Jan. 14.

Flying Branch.

Capts. to be actg. Majs. whilst employed as Majs. (A.) :—F. D. Stevens; July 21, 1918. A. Bell-Irving, M.C.; Aug. 1, 1918. D. C. Miller; Aug. 16, 1918. G. J. Maxwell, M.C., D.F.C.; Aug. 18, 1918. J. G. Selby, M.C., D. Stewart; Sept. 1, 1918. A. Duguid, H. R. Harker, M.C., L. H. T. Sloan; Oct. 1, 1918. R. H. Hood; Nov. 1, 1918.

Capt. W. J. Calderwood to be actg. Maj. whilst employed as Maj. (K.B.); Jan. 1.

Capt. (actg. Maj.) W. A. Hannay relinquishes the actg. rank of Maj. on ceasing to be specially employed; Feb. 19.

Cadt. H. M. Ferreira to be Capt. (A.), from (S.O.); Dec. 13, 1918.

Lieuts. to be actg. Capts. whilst employed as Capts. (A.) :—J. R. Fullarton; Sept. 1, 1918. W. W. Fielding; Sept. 5, 1918. A. H. Beach; Oct. 21, 1918. H. H. Shorter; Nov. 1, 1918. F. C. Pockney (from T.); Dec. 1, 1918 (substituted for notification in *Gazette*, Feb. 4).

Lieuts. to be Lieuts. (A.), from Obs. Officers :—(Hon. Capt.) L. W. Schneider; Feb. 9. (Actg. Capt.) C. T. Anderson; Feb. 11 (and to retain his actg. rank); H. H. Jones, H. J. Weaver; Feb. 14.

Sec. Lieut. (Hon. Lieut.) D. F. Anderson to be Lieut.; April 2, 1918.

Sec. Lieut. H. C. Maller to be Sec. Lieut. (A.) from Obs. Officer; Feb. 8.

Flt. Cadet 137879 E. R. S. Phillips is granted a temp. commn. as Sec. Lieut. (A.); Aug. 29, 1918.

The following are granted temp. commns. as Sec. Lieuts. (Obs. Officers) :—R. J. H. Ganson (Sec. Lieut., Gord. Highrs., T.F.); May 22, 1918. T. F. Blight (Lieut., Manitoba R., C.E.F.; June 6, 1918 (and to be Hon. Lieut.).

Flt. Cadet C. Potter is granted a temp. commn. as Sec. Lieut. (O.); Nov. 3, 1918.

The following relinquish their commns. on ceasing to be employed :—Lieut. C. V. J. Borton (Lieut., Nort. R.); June 20, 1918. Sec. Lieut. G. R. Smith (Lieut., Can. M.G.C.); Dec. 12, 1918. Lieut. W. A. Winter (Lieut., Can. Eng.); Dec. 30, 1918. Lieut. C. R. Cuthbert, M.C. (Lieut., R.F.A.); Feb. 11. Sec. Lieut. (Hon. Lieut.) C. G. Johnson (Lieut., Can. Rly. Troops); Feb. 14.

The following are transfd. to the Unemployed List :—Sec. Lieut. (Hon. Capt.) C. P. Tindal-Atkinson; Jan. 2. Lieut. G. B. Ash; Jan. 10. Lieut. P. W. Birkbeck; Jan. 11. Lieut. D. A. Strutt; Jan. 14. Sec. Lieut. W. R. Richardson, Sec. Lieut. F. C. L. Young; Jan. 15. Sec. Lieut. W. T. C. Blake (3rd Glouc. R.), Capt. A. W. Farquhar; Jan. 17. Capt. G. K. Cooper, Sec. Lieut. D. M. Tomlinson; Jan. 18. Sec. Lieut. H. Thomas; Jan. 20. Sec. Lieut. K. J. G. Bellamy, Sec. Lieut. H. Cameron, Maj. (actg. Lieut.-Col.) E. W. Powell; Jan. 22. Lieut. A. L. Rimer; Jan. 24. Sec. Lieut. T. C. Lennox, Lieut. R. G. Mitchell, Lieut. M. F. R. Plowman, Lieut. H. R. H. Ward; Jan. 25. Capt. L. A. T. Pritchard, Sec. Lieut. W. Whatmore; Jan. 26. Lieut. A. W. Higson, Lieut. D. J. Hughes, D.F.C., Sec. Lieut. (Hon. Lieut.) J. J. Saunders (Lieut., R.G.A., T.F.), Capt. C. H. Waring (Hussars, S.R.), Sec. Lieut. W. S. Woolfe (R. Berks R.) Jan. 28. Lieut. J. E. G. Mosby, D.S.O., R.G.A.); Jan. 29. Lieut. A. P. Kelly, M.C.; Jan. 30. Sec. Lieut. R. W. Fyson, Sec. Lieut. C. J. Locke, Lieut. (actg. Capt.) R. O. Williams; Jan. 31. Lieut. A. H. Burton, Sec. Lieut. (actg. Capt.) S. G. Williams, Sec. Lieut. G. G. Wood; Feb. 1. Lieut. (actg. Capt.) G. R. Beck (Lond. R., T.F.), Lieut. F. J. A. Bull, Sec. Lieut. P. Hinde, Capt. J. D. Latta, M.C., Sec. Lieut. E. J. Wills, Sec. Lieut. R. S. T. Wood; Feb. 2. Lieut. R. A. Greenwell (R.F.A., T.F.), Sec. Lieut. S. G. Gordon, Sec. Lieut. G. Westcott; Feb. 3. Lieut. (actg. Cadt.) J. W. Baker, M.C., Lieut. J. H. Gotch, Lieut. W. A. John, Lieut. L. G. Smith, Lieut. A. H. Woodward; Feb. 4. Capt. A. Binnie, M.C., Capt. N. W. G. Blackburn, Sec. Lieut. (Hon. Lieut.) R. E. Baty, M.C., Sec. Lieut. R. Y. Eccles, Lieut. R. V. Facey, Lieut. F. W. Field, Sec. Lieut. F. W. G. Goodwin, Capt. D. F. Upjohn, Sec. Lieut. P. W. Watson; Feb. 5. Sec. Lieut. H. C. Alden, Lieut. E. E. Ashton, Sec. Lieut. F. B. Barlow, Sec. Lieut. C. H. Bingham, Lieut. M. H. Drake, Sec. Lieut. B. H. Fitter, Sec. Lieut. F. J. Hardy, Sec. Lieut. J. Horrocks, Sec. Lieut. M. K. Work; Feb. 6. Sec. Lieut. J. M. Ballard (R.F.A., S.R.), Sec. Lieut. H. Chapman, Capt. A. Dennis (Suff. R.), Capt. R. W. Frazier; Feb. 7. Sec. Lieut. A. C. Beever, Lieut. A. W. Wood; Feb. 8. Lieut. (actg. Capt.) W. C. Carter; Feb. 9. Lieut. W. J. P. Dicks, Lieut. F. Hodgson (Northum. Fus., T.F.), Capt. E. Y. Hughes (Lieut., R.F.A., T.F.), Lieut. W. T. Waldir; Feb. 10. Sec. Lieut. C. W. S. James, Capt. H. W. Kendall, A.F.C., Sec. Lieut. A. E. Needham, Lieut. E. C. Williams; Feb. 11. Sec. Lieut. F. A. Hickson, Lieut. J. A. Hoogtern, Sec. Lieut. S. C. Lambert, Lieut. G. E. Playford, Lieut. W. G. Westcott; Feb. 12. Capt. F. Cleary, A.F.C., Sec. Lieut. T. Dootson, Sec. Lieut. W. D. Hartland, Sec. Lieut. A. Outhwaite, Sec. Lieut. E. Vickers; Feb. 13. (Lieut. actg. Capt.) C. W. Hawker, M.C. (Lieut., R.F.A., S.R.), Capt. J. M. Turner; Feb. 14. Sec. Lieut. F. Abrahams. Lieut. R. J. Donaldson, Sec. Lieut. M. P. Fraser substituted for notification in the *Gazette* of Jan. 24). Sec. Lieut. H. L. Howell, Lieut. G. F. C. Hopewell; Feb. 15. Lieut. D. C. Doyle, Sec. Lieut. B. D. Passow, Lieut. M. H. Picot, M.C.; Feb. 16. Sec. Lieut. L. T. Harriss, Lieut. T. L. W. Stallibrass, Lieut. E. G. L. Ward; Feb. 17. Lieut. H. V. Caunt. Lieut. J. MacNaught, Sec. Lieut. S. W. H. Reynolds, Sec. Lieut. L. H. Starkey, Sec. Lieut. F. Wheatcroft, Capt. H. E. Went; Feb. 18. (Sec. Lieut. Hon. Lieut.) K. Jones (Capt., Berks. R., T.F.), (Lieut. actg. Capt.) F. A. Martin, Sec. Lieut. R. M. Morris, Sec. Lieut. C. H. Watson, Lieut. H. H. Wright; Feb. 19. Lieut. E. G. L. Brown (Lieut., R.G.A., T.F.), Lieut. E. A. Cooke, Lieut. J. M. Dillon, Lieut. E. W. Unmack; Feb. 20. Sec. Lieut. W. G. Black, Sec. Lieut. W. E. Brown, Sec. Lieut. F. M. Buchanan, Sec. Lieut. F. Campbell, Sec. Lieut. B. L. Cook, Lieut. A. W. Fraser, Sec. Lieut. A. K. McGill; Feb. 23.

The following Lieuts. relinquish their commns. on account of ill-health, and are permitted to retain their rank :—C. W. Berry (contracted on active service). R. N. Bullock (S. Staffs. R.) contracted on active service, T. R. Hepple, F. I. Jacks, R. Main (caused by wounds), K. D. McLeod, S. H. Pilling; March 1.

The following Lieuts. relinquish their commns. on account of ill-health :—R. S. Macfarlane (contracted on active service), (actg. Capt.) J. Mundie (Gord. Highrs., T.F.); March 1.

The following Sec. Lieuts. relinquish their commns. on account of ill-health, and are permitted to retain their rank : A. Lister (contracted on active service) A. L. Murray; March 1.

Sec. Lieut. L. C. Cox is antedated in his appointment as Sec. Lieut. (A.); July 25, 1918.

Sec. Lieut. H. V. Fellows is antedated in his appointment as Sec. Lieut. (A. and S.); April 11, 1918.

The notification in *Gazette* Jan. 14 concerning Sec. Lieut. D. G. J. Odlum is cancelled.

Administrative Branch.

W. H. Taylor (Lieut., actg. Maj., R.F.A., T.F.) is granted a temp. commn. as Lieut. (seniority April 1, 1918), and to be actg. Maj. while employed as Maj.; Oct. 1, 1918.

The following are granted temp. commns. as Lieuts., and to be actg. Capts. while employed as Capts. :—A. L. Morris, Lieut., R. Fus.; April 1, 1918. S. E. Tidy (Temp. Lieut., actg. Capt., A.C.C.); Aug. 5, 1918, seniority April 1, 1918.)

To be actg. Capts. while employed as Capts. :—Lieut. H. H. Giles; Oct. 26, 1918. Sec. Lieut. (Hon. Lieut.) E. M. Wood, from (T.); Feb. 15.

Capts. (A'ship) to be graded for pay as Lieuts. while employed as Lieuts. :—H. E. C. Plowden; Jan. 18. A. Sparrow, A.F.C.; Jan. 30.

Lieuts. (A.) to be Lieuts. :—D. French; Oct. 5, 1918. L. K. Devitt; Oct. 31, 1918. J. H. Hardman, S. L. Hooper; Nov. 5, 1918. H. G. Bradshaw; Nov. 7, 1918. J. M. Rennie; Nov. 11, 1918. O. C. George, W. D. McKinnon; Nov. 14, 1918. A. C. Kiddell; Nov. 16, 1918. G. D. Robin; Dec. 6, 1918. I. C. Sanderson; Dec. 7, 1918. W. G. Barlow; Dec. 12, 1918. R. Milner; Dec. 18, 1918. J. Handley; Dec. 26, 1918. B. W. Blayney; Dec. 30, 1918. D. Menzies; Jan. 2. C. Miller; Jan. 3. C. M. Shilcock; Jan. 7. H. Rowbotham; Jan. 8. C. P. Robertson; Jan. 10. A. J. Kilpatrick; Jan. 13. S. W. Graham; Feb. 1. C. Evans, M. Helliwell; Feb. 13.

Lieut. J. Drew to be Lieut., from (K.B.); Oct. 21, 1918.

Lieuts. (O.) to be Lieuts. :—R. W. Briggs; Nov. 18, 1918. (Hon. Capt.) J. E. Johnston; Dec. 25, 1918. F. Wilkinson; Jan. 8. G. T. Stoneham; Feb. 4.

Sec. Lieuts. to be actg. Lieuts. whilst employed as Lieuts. :—S. M. Stringfield; Sept. 30, 1918. J. R. McDonald, F. A. Osborn; Dec. 1, 1918. Hon. Capt.) D. M. Berry, from (A.); Dec. 2, 1918. A. E. F. McCreary; Jan. 1.

Sec. Lieut. J. S. Card to be actg. Lieut. whilst specially employed; Oct. 10, 1918.

Sec. Lieuts. to be Sec. Lieuts., from (A.) :—J. W. Pope; Sept. 7, 1918. (Substituted for notification in *Gazette* Feb. 4.) A. T. William; Oct. 10, 1918. (Hon. Maj.) G. A. E. Chapman; Oct. 15, 1918 (and to be Hon. Maj.); H. Rawsthorne; Nov. 27, 1918. W. T. Leonard; Nov. 29, 1918. A. W. Elliott; Dec. 2, 1918. N. H. Midgley; Dec. 16, 1918. (Hon. Lieut.) A. K. Boning (and to be Hon. Lieut.), V. S. Stevens; Jan. 20. A. W. Hardwich; Jan. 22. M. R. De Miege; Feb. 12. W. R. Souter; Feb. 13.

Sec. Lieuts. to be Sec. Lieuts., (from A. and S.) :—S. Graves; Oct. 23, 1918. M. Marks; Nov. 16, 1918. S. C. Leith; Dec. 16, 1918. C. Norton Dec. 31, 1918.

Sec. Lieuts. to be Sec. Lieuts. from (O.) :—L. C. Baker; Nov. 6, 1918. L. E. Glover; Dec. 2, 1918. N. Riddell; Jan. 4. (And to be Hon. Lieut.) S. A. Church, J. P. Elliott; Jan. 24. N. Johnson; Feb. 11.

Sec. Lieut. L. M. Britten to be Sec. Lieut., from (T.); Feb. 11.

Sec. Lieut. (actg. Capt.) G. H. Blake, D.C.M., relinquishes the actg. rank of Capt.; Feb. 8 (substituted for notification in *Gazette* Feb. 18).

Lieut. C. H. Bidmead relinquishes his commn. on ceasing to be employed; Feb. 14.

The following are transfd. to Unemployed List :—Sec. Lieut. actg. Lieut.) T. P. Prichard; Jan. 10. Capt. R. Tyler; Jan. 15. Lieut. W. Stannard; Jan. 17. Sec. Lieut. J. W. Beeson; Jan. 23. Sec. Lieut. T. Cooper; Jan. 24. Sec. Lieut. J. K. Henderson; Jan. 26. Sec. Lieut. W. H. Stow; Jan. 28. Lieut. W. N. Cuthbert, Lieut. (actg. Capt.) C. F. Powell; Jan. 30. Capt. (actg. Maj.) R. A. Buckmaster; Jan. 31. Capt. H. I. Eardley, Lieut. S. Orchard; Feb. 1. Sec. Lieut. W. C. G. Stokes; Feb. 4. Lieut. (Hon. Capt.) T. Griffiths, Sec. Lieut. A. L. Hopson; Feb. 5. Sec. Lieut. R. V. Dickins,

Lieut. C. S. Wells; Feb. 7. Capt. W. L. Burt, Sec. Lieut. H. A. Lambert; Feb. 8. Lieut. C. R. Eck; Feb. 11. Lieut. A. F. Basset, Sec. Lieut. J. C. Kyd, Sec. Lieut. J. K. Owen; Feb. 12. Lieut. (Hon. Capt.) R. J. S. Lund · Feb. 14. Sec. Lieut. B. A. Bent; Feb. 15. Sec. Lieut. L. J. R. Bertling, Lieut. A. Heath, Sec. Lieut. C. W. Wheeler; Feb. 19. Capt. O. L. P. Crowden resigns his commn.; March 1.

The following Sec. Lieuts. relinquish their commns. on account of ill-health and are permitted to retain their rank:—H. J. Child, S. G. Hawkey, R. C. Jennings, A. B. Peters; March 1.

The name of Sec. Lieut. O. J. Dean is as now described, and not Dear, as in *Gazette* Jan. 7.

Technical Branch.

Lieut. (actg. Capt.) D. E. Barnett to be actg. Maj. while employed as Maj. (Grade B.); Oct. 1, 1918.

Capt. J. Yates to be graded for pay as Capt. while employed as Capt. (Grade A) (from K.B.); Oct. 10.

Lieut. H. A. Samson to be actg. Capt. while employed as Capt. (Grade A); Nov. 12, 1918.

Lieut. A. Ross (No. 14071) to be actg. Capt. while employed as Capt. (Grade B); Oct. 1, 1918.

Sec. Lieut. (actg. Lieut.) F. A. Dickinson to be actg. Capt. while employed as Capt. (Grade B); Nov. 1, 1918.

AVIATION IN PARLIAMENT

Casualties in the R.A.F.

MR. BONAR LAW, in the House of Commons on February 24, stated that the casualties in the R.F.C. to April 1, 1918, were included in the Army Casualties.

The number of casualties in the Royal Air Force, from April 1, 1918, to the date of the armistice, is as follows:—

Killed.		Wounded.	
Officers.	Other Ranks.	Officers.	Other Ranks.
1,551	1,129	2,357	631
Missing (including Prisoners).			
Officers.	Other Ranks.	Officers.	Other Ranks.
1,612	225	45	39

The missing are nearly all prisoners of war, who have now practically all been repatriated.

Air Raid Insurance.

MR. KENNEDY JONES asked the Chancellor of the Exchequer what surplus moneys resulting from aircraft insurance are in the hands of the various insurance companies who, on behalf of the Government, effected aircraft insurance; whether such surplus moneys exceed seven millions sterling; and what are the intentions of the Government respecting such surplus?

Mr. Bridgeman: The moneys resulting from aircraft insurance in the hands of the various insurance companies who, on behalf of the Government, effected aircraft insurance are purely nominal, as they have been regularly paid over to the Government in monthly accounts in accordance with agreement, the terms of which are stated in Schedule III of Command Paper 7997. The excess of premium over payments, which amounts to over ten millions, has, of course, gone into the National Exchequer.

SIR HERBERT NIELD asked the Secretary to the Treasury if he will state the aggregate sum received for premiums on Government insurances against damage by hostile aircraft or bombardment which were current at the date of the signing of the armistice; what portion of this sum represented the unexpired periods of insurance; when the risk ceased to attach; and whether the Government propose to repay to the insurers the proportion of premiums received by them in respect of obligations which had ceased to exist, and in particular on policies which had upwards of six months to run when the risk terminated?

Mr. Bridgeman: The War Risks Insurance Office are not in a position to supply the information asked for in the first and second parts of the question, and the various approved companies could not readily furnish the information in view of the dispersal of the extra staffs employed by them for aircraft insurance business. The risk has not ceased to attach with the signing of the armistice, aircraft policies still in force covering the risk of damage by aircraft of the Royal Air Force, and aircraft and bombardment policies covering, in addition, the risk of damage by the explosion of mines which drift on the coast.

R.A.F. Cadets in Egypt.

MAJ. EARL WINTERTON asked the Secretary of State for War if he is aware that Air Force cadets in Egypt who are surplus to needs have been told that they are to revert to their original Army rank; and if he is aware that great hardship in particular is caused to those former cadets who are returning to the United Kingdom and are not allowed to take with them the additional kit which they were compelled to buy as cadets?

Maj.-Genl. Seely: Instructions have been issued that flight cadets are not to be reduced in rank on the grounds stated in the question, and that any who have been so reduced are to be reappointed as from the date of reduction. I am making inquiries in regard to the second part of the question, and will communicate the result to my noble friend.

Who Invented Gotha Screens?

GENL. SIR IVOR PHILIPPS asked the Minister of Munitions who was the originator or inventor of the so-called Gotha aprons or screens for checking aeroplane attacks; when the idea was first adopted by the Ministry of Munitions; and when it was first put into operation?

Mr. Kellaway: The plan of suspending entanglements from balloons was patented as early as 1913. Several hundreds of proposals of this nature had been received by the Inventions Departments and considered by the responsible authorities by October, 1917. The plans actually adopted in October, 1917, were from designs of screens used in the defence of Venice, and any credit for their initial adoption and operation is due to the Italian Government.

R.A.F. Machines Burnt.

MR. JOYNSON-HICKS, on February 25, asked the Under-Secretary of State to the Air Ministry how many machines have since the armistice been burnt in France; whether, in order to accomplish this, they were soaked with the best aviation spirit; and whether there was no possibility of selling any of them?

Maj.-Genl. Seely: Twelve machines of obsolete type were burnt in France after removal of the engines and instruments. They had been damaged in landing at places where there were no facilities for reducing them to produce, nor means for transporting them elsewhere, nor was there any possibility of selling them. I have no information as to the use of petrol to assist in burning them.

Machines Dismantled or Destroyed.

MR. JOYNSON-HICKS asked the Under-Secretary of State to the Air Ministry how many machines have been dismantled and reduced to the condition of scrap in England since the armistice; and whether he has received any and, if so, what offers for purchase of such machines; and (2) how many aeroplanes were on charge on November 11, 1918; and how many have since been destroyed.

Maj.-Genl. Seely: The number of aeroplanes on charge at November 11 was 20,850. The number of seaplanes 1,248. Since then, and up to the date of the last Return, 2,142 obsolete machines have been reduced to produce, and in addition, 1,823 machines of standard types which have been damaged and were not repaired have also been reduced. These figures include 2,460 which were reduced to produce in England. The disposal of aircraft surplus to requirements is undertaken by the Ministry of Munitions, and my hon. friend will perhaps address to that Department any questions relating to offers of purchase.

Demobilisation Gratuity.

LIEUT.-COL. BURGOYNE asked the Under-Secretary of State to the Air Ministry whether he is aware that in the case of officers who have served both in the R.N.A.S. and in the R.A.F. Messrs. Cox and Co. are crediting officers now demobilised with a gratuity based upon the length of service in the last force alone; and whether it is a fact that gratuities to demobilised officers should extend over the whole period that they have served in a commissioned rank whatever the arm in which they have served, so long as they come within the designations of the Army Order covering gratuities?

Maj.-GENL. SEELY: The recent Admiralty Order granting gratuities on demobilisation to temporary naval officers is being applied to R.N.A.S. officers transferred to the Air Force. An Air Ministry Order on the subject will shortly be issued, and officers already demobilised will have any balance of gratuity credited to them.

Air Ministry Headquarters.

COL. MALONE asked the Under-Secretary of State to the Air Ministry whether it is proposed to move the Air Ministry to buildings in Kingsway; and whether, in view of the increasing importance of the Air Ministry and its relative status to other Government Departments, it would be preferable to select some site nearer Whitehall, such as the National Liberal Club, the Admiralty Controller, or other convenient building?

Sir Alfred Mond: The answer to the first part of the question is in the affirmative. In reply to the second part of the question, it would undoubtedly be preferable for the Air Ministry to be accommodated nearer Whitehall, and every effort has been made to do so but without success, owing to the largeness of the staff to be accommodated and the impossibility of obtaining adequate and satisfactory accommodation. The buildings suggested are in full occupation by Government staffs.

Air Raid Insurance.

LIEUT.-COMDR. CRAIG, on February 27, asked the Secretary to the Treasury what, in round figures, have been the receipts and payments, respectively, under the Government scheme of aircraft and bombardment insurance, etc.

Mr. Bridgeman: It is proposed to lay before Parliament shortly an interim statement showing the approximate results of the various Government war risk insurance schemes.

LIEUT.-COMDR. CRAIG asked the Secretary to the Treasury whether the Government scheme of aircraft and bombardment insurance was originated with the purpose of assisting out of national resources to insurance at easy rates persons exposed to enemy attacks by sea and air; and whether he will consider the desirability of distributing the profits, if any, made by the Government in the conduct of the insurance scheme, as well as proportions of unexpired premiums, so as to relieve the Government from the suspicion of having conducted a commercial enterprise under the guise of assisting the people?

Mr. Bridgeman: The Government scheme of aircraft and bombardment insurance was formed with a view to providing insurance at as low a rate as practicable against damage to property by air raids and bombardment. The profit resulting from this scheme is paid into the public exchequer, which financed the scheme, and which would have had to find the money if there had been a loss.

Leave from Malta.

MR. ALFRED SHORT asked the Secretary of State for War whether men serving in the R.A.F. in connection with the seaplane base, Malta, who have been on the island for about two and a-half years without any home leave, made a request toward the end of last year for leave and permission to finish the time intervening for demobilisation at a home station; whether he is aware that the request was made through the proper channels to the major and to the commanding officer for permission to put the case before the group officer; whether he is aware that the question was dismissed as frivolous, and a warning given that a similar request would result in the senior hand being arrested and court-martialled; whether this sort of treatment of men for taking legitimate constitutional action has his approval; and whether, in view of the report that there are three times the number of men at Malta to do less than half the work there was in war-time, steps can be taken to grant home leave?

MAJ.-GENL. SEELY: An application, as indicated in the first part of the question, was made at the end of last year through the proper channels, and so far as reliefs were available for carrying on the necessary work of the station, the men concerned have been sent home for demobilisation. I am informed that there is no truth whatever in the statement that the request for drafting to the home establishment was dismissed as frivolous. I would add that the present strength of the unit in question is less than 30 per cent. of its establishment.

Accidents at the R.A.E.

VISCOUNT WOLMER asked the Secretary of State for War whether civilian observers employed in flying at the Royal Aircraft Establishment at Farnborough are not entitled to any compensation for accidents under the Workmen's Compensation Acts nor to the same compensation as soldiers would receive in the event of an accident; and whether he can state what steps he proposes to take in the matter?

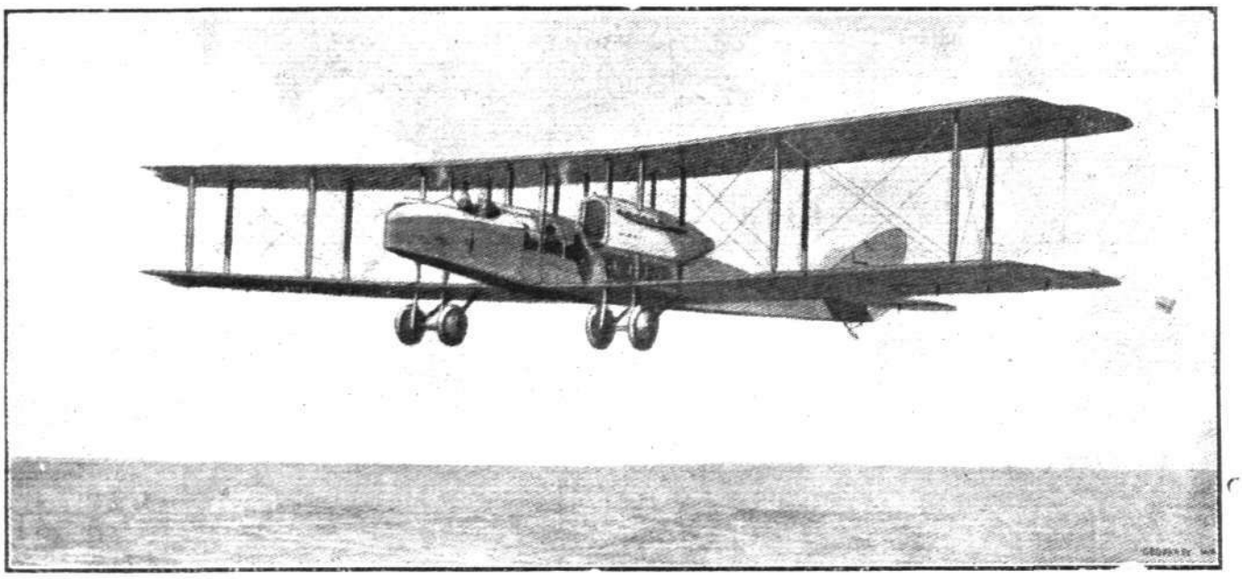
Mr. James Hope: Any civilian observer employed by the Royal Aircraft Establishment, South Farnborough, whose remuneration does not exceed £250 per annum, and who sustains an injury arising out of and in the course of his employment, would be dealt with under the terms of the Workmen's Compensation Acts or of the Government scheme thereunder, if he had accepted the latter. A civilian observer of that establishment with remuneration exceeding £250 per annum would be dealt with in accordance with the terms of a special Warrant of the Treasury under Section 1 of the Superannuation Act, 1887, a copy of which is being transmitted to my noble friend.

FLIGHT
& AIRCRAFT ENGINEER

PEACE TIME AEROPLANES

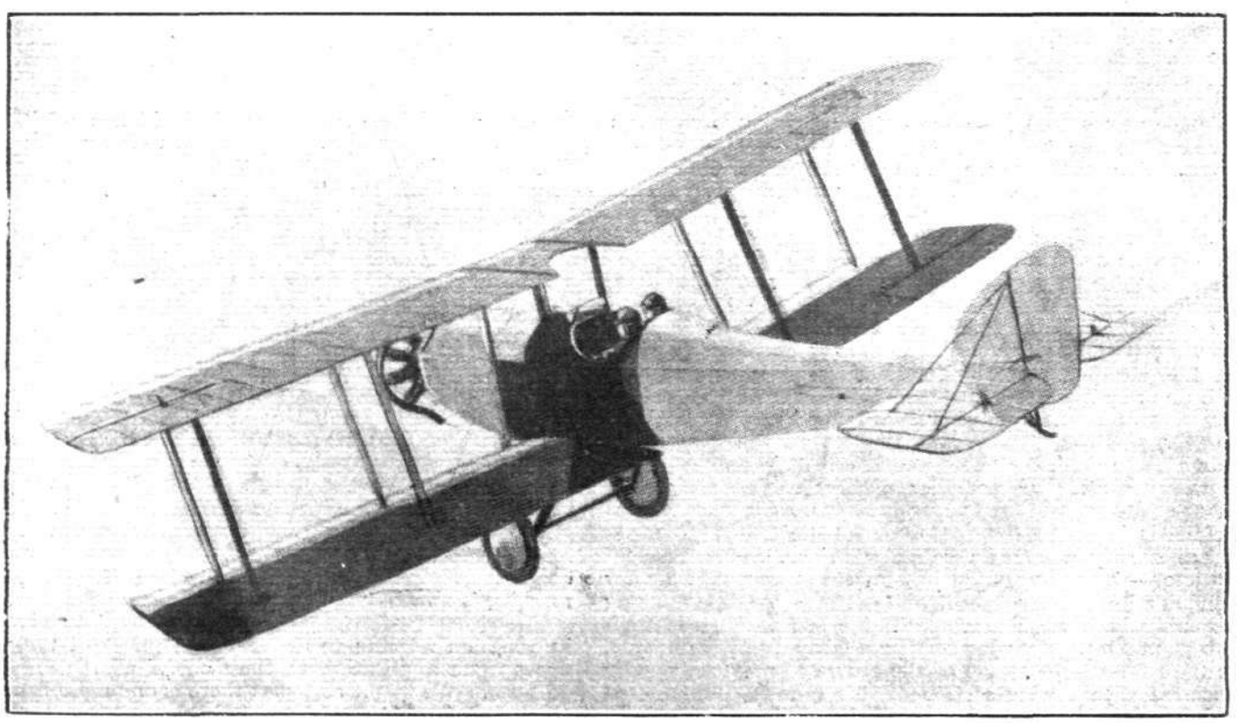
OWING to the restrictions imposed by the order relating to aeroplane designs, which prohibited the getting out of anything except general arrangement drawings of a new design, the British Aircraft Industry has been greatly hampered in its change-over from war work to peace machines. These difficulties are now, it is true, partly overcome by the cancelling of the order which decreed that no firm was allowed to get out original designs except after obtaining an official permit. But great damage had already been done, not by the order itself, which was probably a necessary evil during the War, but by the fact that, even after it was quite certain that the Armistice would be signed, the Air Ministry refused to let constructors turn over some part of their works and drawing offices to post-War production problems. Had this been permitted there can be little doubt that British constructors would not now have been labouring under a great disadvantage compared with firms of other countries in the competition for after-the-War trade. The consequence has been that while our manufacturers are endeavouring to obtain permission to export machines and engines, and are being held up by vague and indefinite replies from the authorities, foreign firms are losing no time in establishing themselves abroad, and in getting their hands on any foreign orders that may be available.

In spite of such handicaps, however, it is gratifying to know that British firms are quite alive to the possibilities of both home and foreign trade, and are getting out designs for post-War machines as rapidly as conditions will allow.

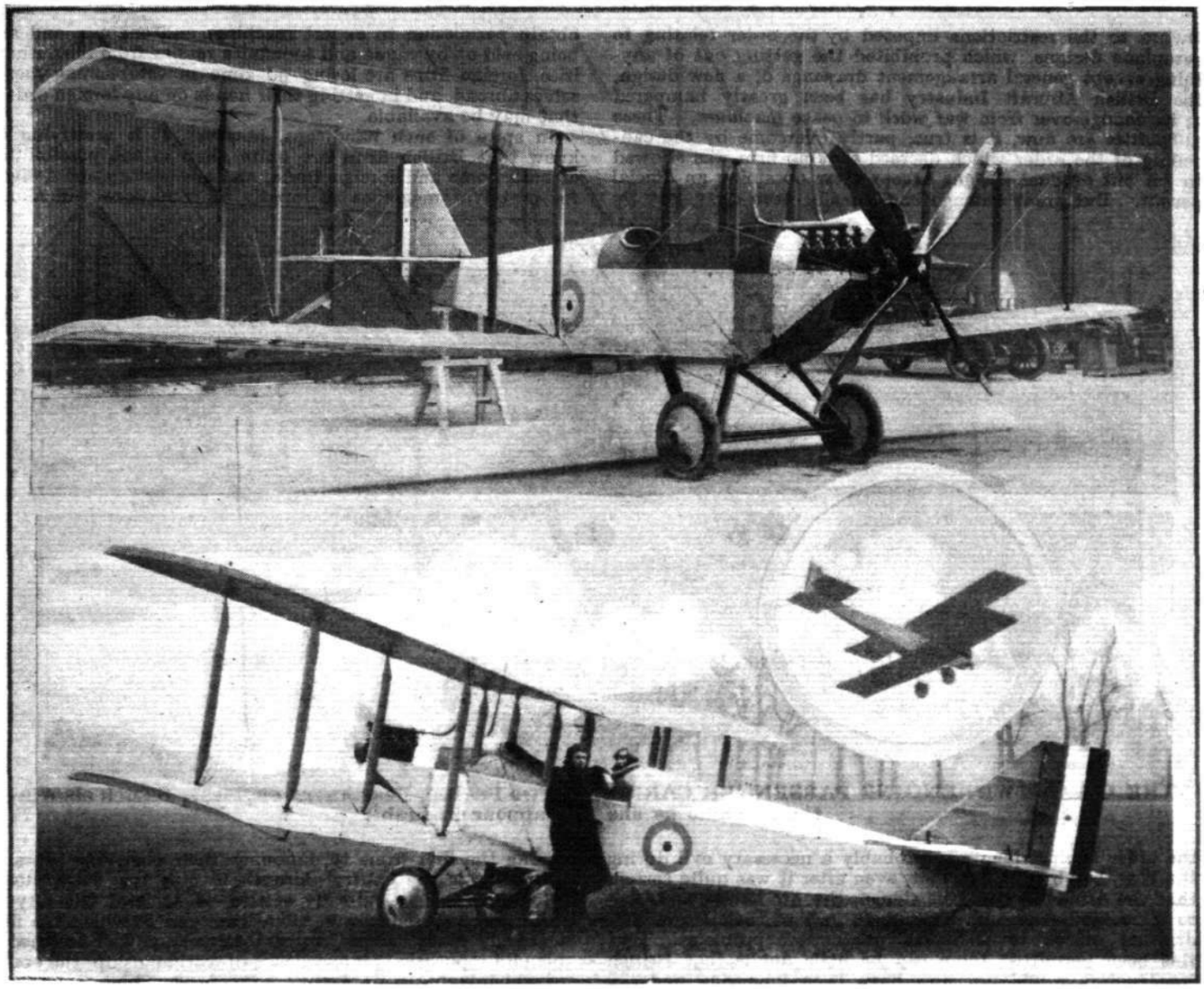


THE C.A.C. TWIN-ENGINE PASSENGER CARRIER.—Two 160 h.p. Beardmore engines. Sketch showing the machine as she will appear in flight.

Among the first firms to announce their post-War types of aeroplanes is the Central Aircraft Co., of 179, High Road, Kilburn, who have already settled on at least three types which will be produced in quantities, and of which the first is already ready. The Central Aircraft Co. has attained a splendid reputation for excellence of workmanship, the credit for which is due to Mr. Arthur J. Cattle, the Chief of the Company, for whom the best is hardly good enough. Under his energetic guidance the business is expanding rapidly and bids fair in the near future to assume very large pro-



THE C.A.C. SIDE-BY-SIDE TOURING AEROPLANE.—100 h.p. Anzani engine. A sketch of the proposed machine.



TWO VIEWS OF THE C.A.C. SCHOOL MACHINE.—Inset is the machine in flight. In the bottom photograph Mr. Sykes is in the pilot's seat, while standing against the machine is Mr. "Tony" Fletcher, the designer.

portions. The first of the trio is a two-seater school machine, fitted with a French 70 h.p. Renault, but so designed as to be adapted to take any engine of similar type, such as the Wolseley and R.A.F. engines. The first of these machines was finished recently, which is a highly creditable performance, considering the short time that has elapsed since the cancelling of the restrictions on private designs. The machine was tested by the firm's chief pilot, Mr. Herbert Sykes, O.B.E., at the aerodrome a couple of weeks ago, and at once showed that it was quite up to the expectations of its designer, Mr. "Tony" Fletcher, who is in charge of the design department of the Central Aircraft Co.

The machine is a tandem two-seater, fitted with dual controls. The lines of the machine are quite pleasing, in spite of the difficulty of providing a neat nose where a Renault or similar engine is fitted. The designer has kept in mind ease and cheapness of manufacture, and this is obtained, not by any scamping in workmanship, which as a matter of course is excellent, but by designing for interchangeability wherever possible. Thus, for instance, all the inter-plane struts are identical, the one type of strut fitting anywhere in the wing cellule. In a similar manner the elevator flaps and the rudder are identical and interchangeable. As the machine is intended for school work—the Central Aircraft Co. are shortly starting a school with Mr. Sykes as chief instructor—the wing section has been designed with a view to giving a low landing speed, while at the same time reaching reasonably high maximum speed (the speed range is from 28 to 70 m.p.h.). The wing section is fairly deeply cambered, but the rather large travel of the centre of pressure usually associated with a wing section of this type is counteracted by giving a slight reflex curvature to the trailing edge. There is therefore no reason to suppose that the machine will not be quite easy to pull out of a nose dive, and although the elevator flaps are large, giving ample control, the large fixed tail plane should effectively prevent a pupil from too sudden flattening out after a dive. The machine should prove popular, not only at the Central Aircraft Co.'s School itself, but also among other firms who wish to obtain a good reliable type of school machine.

In addition to the school machine, which is a *fait accompli*, the Central Aircraft Co. is marketing two more types. One of these is a touring model in which the pilot and passenger sit side by side. This machine will be fitted with a 100 h.p. Anzani engine, and the wings will be arranged to fold in the manner of most modern seaplanes, so that the question of storage becomes much simplified, the machine occupying quite a small space when the wings are folded. This machine is expected to have a performance of 30 to 80 m.p.h., and is very well suited to touring or sporting purposes.

The third model to which reference has been made is a twin-engine machine, designed as a passenger carrier seating eight passengers. This machine is of very pleasing appearance, and the engine power being comparatively low, two Beardmore engines of 160 h.p. each, should not prove excessively expensive to run. The cabin will have non-splintering windows of Triplex glass, and will be electrically heated, thus providing for the comfort of the passengers. If desired, the machine can be used for carrying half a ton of goods or mails instead of the passengers. With three hours' fuel on board the speed range is expected to be 40 to 90 m.p.h. This machine is now in course of construction.

The Central Aircraft Co. will be pleased to give further information relating to delivery and prices of their various types upon application to their offices at 179, High Road, Kilburn. We might add that there is one more type coming through, of which we are not, however, permitted to give any particulars at present, but it is hoped to prove the last word in performance. This machine may be expected to go through its trials in the coming spring.

FLIGHT

SIDE-WINDS

A MOST successful meeting of manufacturers of A.G.S. parts was held at the Cannon Street Hotel on Friday, February 28. It was decided to form an association to protect the members and settle questions with the Government.

After hearing the views of the gentlemen present, a resolution was adopted that the first thing to do was to form a strong representative committee, and the following were elected :—

Messrs. S. L. Forbes (Messrs. A.G.S. Manufacturing Co.); Arthur Green (Messrs. Coventry Repetition Co., Ltd.); Edward Joseph (Messrs. Ozonair, Ltd.); Sam. G. Mason (Messrs. Sam. G. Mason, Ltd.); A. E. Owen (Messrs. Rubery, Owen and Co.); and J. M. Pirie (Messrs. Edgware Engineering and Aircraft Co., Ltd.); with Mr. Grey McCann acting as secretary.

The feeling of the meeting was that such an association would be not only a great help to the members but also of considerable assistance to the Government, it being felt that it would make working much smoother if the authorities knew they had an association to turn to.

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MR. F. ASTLETT COULSON, who before he went into the Aeroparts Co. was managing director of the Wooler Engineering Co., is now putting on the market a new lightweight motor cycle which should make a strong appeal to flying officers. The machine, which will be known as the Coulson B, has been designed by Mr. Coulson, and the motor will be a 2¾ h.p. Blackburn. One of the special features of the design is the suspension of the rear wheel, which will be carried by a long leaf spring. The wheel spindle is carried on two pivoted side members which are attached to a rigid unbroken frame. Lateral movement is impossible, the bearing surface being of generous fan-shaped construction. The leaf springs are attached to the frame by special brazed lugs, and shackles connect the springs to the side members. The front of the machine will be provided with Druid forks. Other items of the specification, from which the quality of the machine may be judged, are M.L. magneto, Brown and Barlow carburettor, Albion two-speed gear, Lyscett saddle, Clincher, heavy, tyres. And the price is 60 guineas complete. A little booklet giving further particulars of the machine can be obtained from the F. A. Coulson Engineering Co., 199, Piccadilly, W. 1.

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SOME of the newer generation may not have recognised in M. Christiaens, who, as recorded in last week's FLIGHT, was accidentally killed at Wolverhampton last week, one of the pioneers of flying. He was one of the early pilots of Henry Farman machines, on one of which he took part in the Bournemouth meeting. He was also proud of the fact that he was the first man to fly in Russia, India and South Africa, among other places. He had also won fame as a driver of racing cars, his successes on the road including the winning of the Coupe de Liederkerke in 1909. He had also made many records on Brooklands and on the Indianapolis track in America, where he had been in charge of a Sunbeam car. He was a native of Brussels, and after making his escape from Germany in 1915, he served with armoured cars with the Belgian Army for some time. During the latter phases of the War he was in charge of experimental work at the Sunbeam company's factory at Wolverhampton, where his sound knowledge of theory, his skill as a mechanic, and his wide practical experience had proved of the utmost value.

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THE list of aeronautic records in which Wakefield Castrol "R" has played its part grows steadily longer and more imposing. The latest to be announced is the record for a non-rigid airship recently made, when a British airship, fitted with two Fiat motors, from Longside, near Aberdeen, accomplished a non-stop patrol of 101 hours over the North Sea. The flight might have continued for some hours more but for the fact that the water supply, both for motors and men, came to an end. Messrs. C. C. Wakefield and Co., Ltd., are naturally proud of this striking proof of the high efficiency of their lubricant on so severe a test. It is interesting, by the way, to hear that the pilot of the ship was Capt. Warneford, a brother of Lieut. Warneford, V.C.

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IT was with the deepest regret that Messrs. C. A. Vandervell and Co., Ltd., received news of the death of Mr. Bertram Davisson, who was manager of their Manchester depôt before the War. Mr. Davisson joined the Army in 1914 in the Legion of Frontiersmen, and was attached to the Belgian Army. When the Legion was disbanded he went into the R.G.A., and was out in France till the Armistice was signed. He was practically demobilised and about to once more take up his duties with the firm, when he was seized with influenza, and, pneumonia supervening, he passed away on Saturday last.

The late J. C. H. Christiaens, the well-known Belgian pilot who, as recorded in our last issue, was accidentally killed while testing a Sunbeam racing car.

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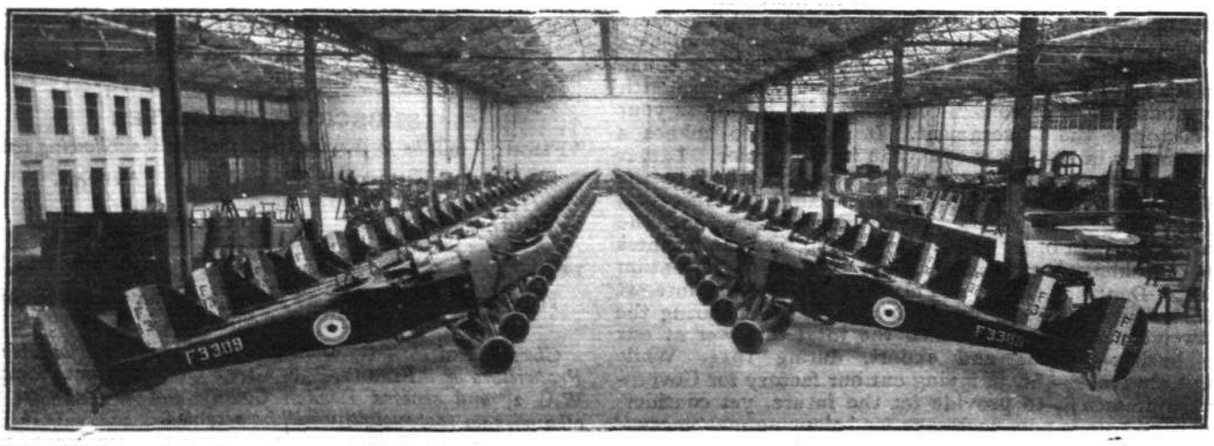

A batch of R.E. 8's in the works of the Siddeley-Deasy Motor Car Co., Ltd., where large numbers of these machines have been built in addition to quantities of the B.H.P. type aero engines, known as "Siddeley-Puma."

COMPANY MATTERS

Frederick Sage and Co.

AT the adjourned fourteenth ordinary general meeting of Frederick Sage and Co., Ltd., on February 26, Mr. Frederick George Sage (the chairman) said: You will see from the profit and loss account now submitted that the dividends distributed out of last year's profits—namely, 7 per cent. on the participating cumulative preference shares and 8 per cent. on the ordinary shares—were fully warranted. In fact, we could have largely increased our distribution, but we prefer to pursue a cautious and conservative policy, so that, after paying these dividends, we are able to recommend the placing to reserve account of the handsome sum of £20,000 and the carrying forward of £16,630.

To meet the rush of war work several factories, chiefly in Peterborough, were rented for short periods, and you will have observed in connection with these the not inconsiderable figure of £29,817 for maintenance and running expenses. These temporary shops are being vacated, and we are concentrating our manufacture in our freehold premises. The making of aircraft continues, and we are retaining expert managers, designers and mechanics for this important class of work. I may mention that the first seaplane made by the company increased the height record from about 2,000 ft. to well over 10,000 ft. We have turned out over 300 aeroplanes, 80 large seaplanes and over 90 cars for airships, also innumerable spare parts, propellers, etc. Our own design of seaplane was adopted as the standard seaplane training machine for 1919. We anticipated that the experience and high degree of efficiency we have attained during the War will allow us to compete for the construction of aircraft for home and foreign Governments and for civilian uses. With regard to what I may describe as our normal business our position is satisfactory. The difficulties before us lie not in the obtaining of orders, but rather in finding the material to meet the requirements of our customers and the skilled mechanics to execute the work with rapidity.

The resolution was carried unanimously.

The formal business was transacted, and at an extraordinary general meeting which was subsequently held the following resolution was unanimously carried:—"That the following addition be made to the articles of association: '91. A.—A director shall, in addition to the remuneration provided in article 91, be entitled to fees not exceeding £100 per annum out of the net profits of each subsidiary company of which he is a director.'"

S. Smith and Sons (Motor Accessories), Ltd.

AN extraordinary general meeting of this company was held on February 26 for the purpose of submitting the following resolution: "That the capital of the company be increased from £300,000 divided into 300,000 shares of £1 each to £500,000 divided into 500,000 shares of £1 each, by the creation of an additional 200,000 shares of £1 each, such additional shares to be issued at such time or times and on such terms and conditions as the directors may prescribe."

Mr. Samuel Smith (chairman) who presided, said: We now propose to obtain your sanction to issue 150,000 of these new shares, for which the Treasury sanction has already been obtained. The remaining 50,000 shares we propose to hold in reserve and under the control of your board, to be issued as and when necessity may arise. Present indications give strong evidence that there is an increased demand for the company's products all over the world, and that there is sufficient work in sight to keep fully occupied the company's large factory at Cricklewood for some long time to come. There is, however, one marked difference in dealing with many thousands of customers compared with having as your chief customer the Government. It is easier to finance a large turnover in the latter case than in the former. Larger stocks have now to be carried, particularly owing to the growth of the export trade—more notably in Australia, New Zealand, South Africa, Dutch East Indies, and the United States. In order to still further increase the business abroad subsidiary companies are in process of formation in France, Denmark, Italy, and elsewhere. It might interest you to know that the turnover at our branches during the past twelve months has equalled the total turnover at our entire business, home and export, during 1914. While we have always sought, in laying out our factory for Government requirements, to provide for the future, yet considerable expenditure is now necessary for balancing machinery if we are to produce on the most economic lines. We are of opinion that the prospective demands for the company's products all over the world warrant the assumption that our maximum turnover during the war will be maintained after a brief interval—an interval which is commonly called the transition or reconstruction period.

Mr. Gordon Smith (managing director) seconded.

The solicitor (Mr. Clifford Turner), in reply to a question, said that the proposed issue would be on the basis of one new share for every two shares at present held.

The resolution was carried unanimously.

NEW COMPANIES REGISTERED

NORTH OF ENGLAND MOTOR AND AIRCRAFT INDUSTRIES, LTD., 232, Deansgate, Manchester.—Capital £5,000, in £1 shares. Promoters of shows, exhibitions, competitions, etc. First directors: J. Newton, J. W. Haworth, T. Garner, R. Woodhead, R. Winn, J. G. Reece and S. Norris.

ZEPHYR CARBURETTORS, LTD., Rowena Works, Holyhead Road, Coventry.—Capital £2,000, in £1 shares. Manufacturers of and dealers in carburettors, automobile, aero and other engines, etc.

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Aeronautical Patents Published

Abbreviations:—cyl. = cylinder; I.C. = internal combustion; m = motors.

APPLIED FOR IN 1917

The numbers in brackets are those under which the Specifications will be printed and abridged, etc.

Published March 6, 1919.

2,230. G. H. THOMAS and B. C. HUCKS. Device for obtaining rotary motion from reciprocatory motion. (122,907.)
2,369. G. HODGES. Planes of flying-machines. (122,916.)
2,932. P. R. RICHMAN. Inclinometer. (122,930.)
3,910. A. COLLIS. Automatic device for indicating position and angle in which an aircraft is flying. (122,948.)
4,332. G. A. A. L. LE COCQ. Hangar for dirigibles. (120,192.)
5,924. J. IMBER. Tanks or receptacles for combustible liquids. (122,853.)
6,951. A. G. FRANCE. Turnbuckles or wire-strainers. (122,974.)
11,746. PHOENIX DYNAMO MANUFACTURING CO. and W. O. MANNING. Twin-engine throttle control. (122,996.)
14,141. E. F. HAYNES. Aerial fuse bombs. (123,014.)

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Index and Title Page for Vol. X.

The 8-page Index for Vol. X of "FLIGHT" (January to December, 1918) is now ready, and can be obtained from the Publishers, 36, Great Queen Street, Kingsway, W.C. 2. Price 8d. per copy, post free.

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